

DEPARTMENT OF PUBLIC WORKS, CANADA

NELSON RIVER

REPORT

UPON

RECONNAISSANCE SURVEY

SEPTEMBER-OCTOBER, 1909



OTTAWA

PRINTED BY C. H. PARMELEE, PRINTER TO THE KING'S MOST
EXCELLENT MAJESTY

CHIEF ENGINEER'S OFFICE,

OTTAWA, February 1, 1910.

SIR,—I have the honour to transmit herewith a report by Mr. A. R. Dufresne, District Engineer, inclosing one by his Assistant, Mr. E. S. Miles, on an investigation made of the Nelson river, Man., to determine the practicability of establishing navigation on that river between Lake Winnipeg and the Hudson bay.

The examination made was one of the nature of a rapid reconnaissance, but Mr. Dufresne states that sufficient information has been obtained to show that any undertaking with a view to establishing navigation on the Nelson river would be a work of considerable magnitude.

I have the honour to be, sir,

Your obedient servant,

EUGENE D. LAFLEUR,

Chief Engineer.

JAS. B. HUNTER, Esq.,

Deputy Minister,

Dept. Public Works.

Ottawa.

DEPARTMENT OF PUBLIC WORKS, CANADA,
DISTRICT ENGINEER'S OFFICE,
WINNIPEG, January 27, 1910.

SIR,—I beg to transmit herewith a report, in duplicate, of an investigation made of the Nelson river, to determine the practicability of establishing navigation on that river, between Lake Winnipeg and the Hudson bay.

This work was authorized by you in instructions contained in your telegram of August 20, 1909. The investigation has been entrusted to Mr. E. S. Miles, who was detached temporarily from the St. Andrews lock staff for this purpose.

Owing to the short time at our disposal, before the end of navigation, the examination in the field was of the nature of a rapid reconnaissance.

Notes have been made, from a general observation of the character of the river, and details worked out for some probable locations of structures.

Sufficient information has been obtained to show that, any undertaking having in view the establishing of navigation on the Nelson river, is one of considerable magnitude.

With the exception of a few diversions in the upper part of the river, it would appear that improvement would be necessary on the lines of raised levels by means of dams with locks in conjunction.

Owing to the width and volume of discharge of the river, dam construction would be expensive. For reasons mentioned above, an approximation of the cost of this undertaking is not possible, but it may be of interest, as an object of comparison, to note that the length of the river and total lift, 430 miles and 700 feet lift, are nearly the same as in the proposed Georgian bay canal; 440 miles and 758 feet lift.

I beg to remain, sir,

Your obedient servant,

A. R. DUFRESNE,
District Engineer.

EUGENE D. LAFLEUR, Esq.,
Chief Engineer,
Dept. Public Works,
Ottawa, Canada.

NELSON RIVER INVESTIGATION.

DEPARTMENT OF PUBLIC WORKS, CANADA,
DISTRICT ENGINEER'S OFFICE,
WINNIPEG, January 14, 1910.

SIR,—I have the honour to submit the following report of reconnaissance work done on the Nelson river.

As instructed by you, I left Selkirk, with one assistant, on August 23, 1909, on ss. *Wolverine*, arriving at Warren's Landing on August 26 and at Norway House on August 27.

The limited time for travelling, before the freeze up, made it impossible for us to do more than rapid reconnaissance work. One aneroid was left at Norway House, to be read three times a day, while another was taken with the party. A hand level, fixed to a light tripod, was used to obtain the difference in water elevations at all rapids and falls, and a box-sextant was used for triangulation purposes. A small current meter was also taken along for gauging the river.

The party, made up of my assistant, two Indians and myself, with one canoe, left Norway House on August 28 and travelling by the East Branch, reached Cross lake on August 30 and Split lake, 243 miles from Warren's Landing, on September 6.

The Norway House Indians not knowing the route from Split lake to the bay, other Indians had to be engaged and the Norway House Indians returned home. As the Indians at that time of year were leaving for their winter hunting grounds, it was very hard to secure men, but three were finally engaged on condition that we would return by way of Split lake and not by way of Oxford House.

We left Split lake on September 8 and arrived at the mouth of the Nelson river on September 15, having been delayed two days by bad weather.

On September 16 and 17 a visit was paid to York Factory where we found the stock of provisions, in the Hudson's Bay Company's Store, very low; the ship from England not having arrived up to that date, and indeed the officer in charge had given up all hope of seeing her this season.

While at York Factory, the aneroid with the party, was compared with the barometer there, and a copy of the readings since September 1 obtained.

The mouth of the Nelson river was left on September 18 and Split lake was reached on September 29. Having obtained fresh men, we left Split lake on October 1 and arrived at Cross lake on October 9, having stopped to get a gauging of the river below Sepewesk lake.

A visit was paid to Whisky Jack Portage on October 10 and leaving the north end of the Portage on October 11, we arrived at Norway House on October 13, via East river. On October 14 we proceeded to Warren's Landing and on October 15 left Warren's Landing on ss. *City of Selkirk* and arrived in Selkirk on October 17, 1909.

Distances from Warren's Landing were obtained from Otto Klotz's survey of 1884. The elevation of Split lake is 470 feet above mean sea level, actual levels, for which information I am indebted to Mr. Armstrong, Chief Engineer of the Hudson Bay Railway. Lake Winnipeg is about elev. 700 as obtained by barometer readings at Norway House and York Factory.

From the information gathered on the trip, I have obtained an approximate profile of the river, (see general plan), and come to the following conclusions:—



Norway House—From River Entrance.



Norway House—Looking towards River.

SESSIONAL PAPER No. 19b

General Description of River.

The rock formation from Lake Winnipeg to Limestone rapids, distance 230 miles, is principally granites. Limestone shows from the head of Limestone rapids, some 32 miles farther down the river. From that point to the mouth of the river no solid rock is seen, but the shores are strewn with small boulders and several deposits of gravel were seen. A very good deposit was noted on the north shore at the 'Extreme Head of Navigation.'

The country is all wooded, but the growth, excepting on the islands in the lakes, is all small. The growth is principally spruce with a mixture of birch and poplar in some places.

A gauging of the river just below Sepewesk lake was taken which gave the flow as 118,400 cubic feet per second. (See Plate No. 1). From information obtained from the Hudson's Bay Company's officers, the water was judged to be at the extreme low level. Old water marks were seen on the rock at that place, 4.75 feet higher. The difference between extreme high and extreme low water in this river, is never more than 6 feet.

No evidences of damage done by ice were noted, the bush in many places growing to the water's edge.

The East river, from Lake Winnipeg to Pipestone lake, is not well adapted for improvement, the channel in several places being as narrow as 150 feet, before Norway House is reached. The first rapid, Sea River Falls, is 43 miles from Warren's Landing and from this fall to Pipestone lake, the York boat route is through winding channels, in some places as narrow as 40 feet. The river is divided into several channels but none of any magnitude were seen.

The shores are low and rocky and not suitable for maintaining a higher level of water. The total fall from Lake Winnipeg to Pipestone lake is about 50 feet.

The west channel has already been navigated with a steam tug as far as the south end of Whisky Jack Portage.

The soundings taken in the channel, at present used in Cross lake, varied from 10 to 20 feet, the average being about 14 feet. The islands in the lake are from two to 14 feet above water and all wooded.

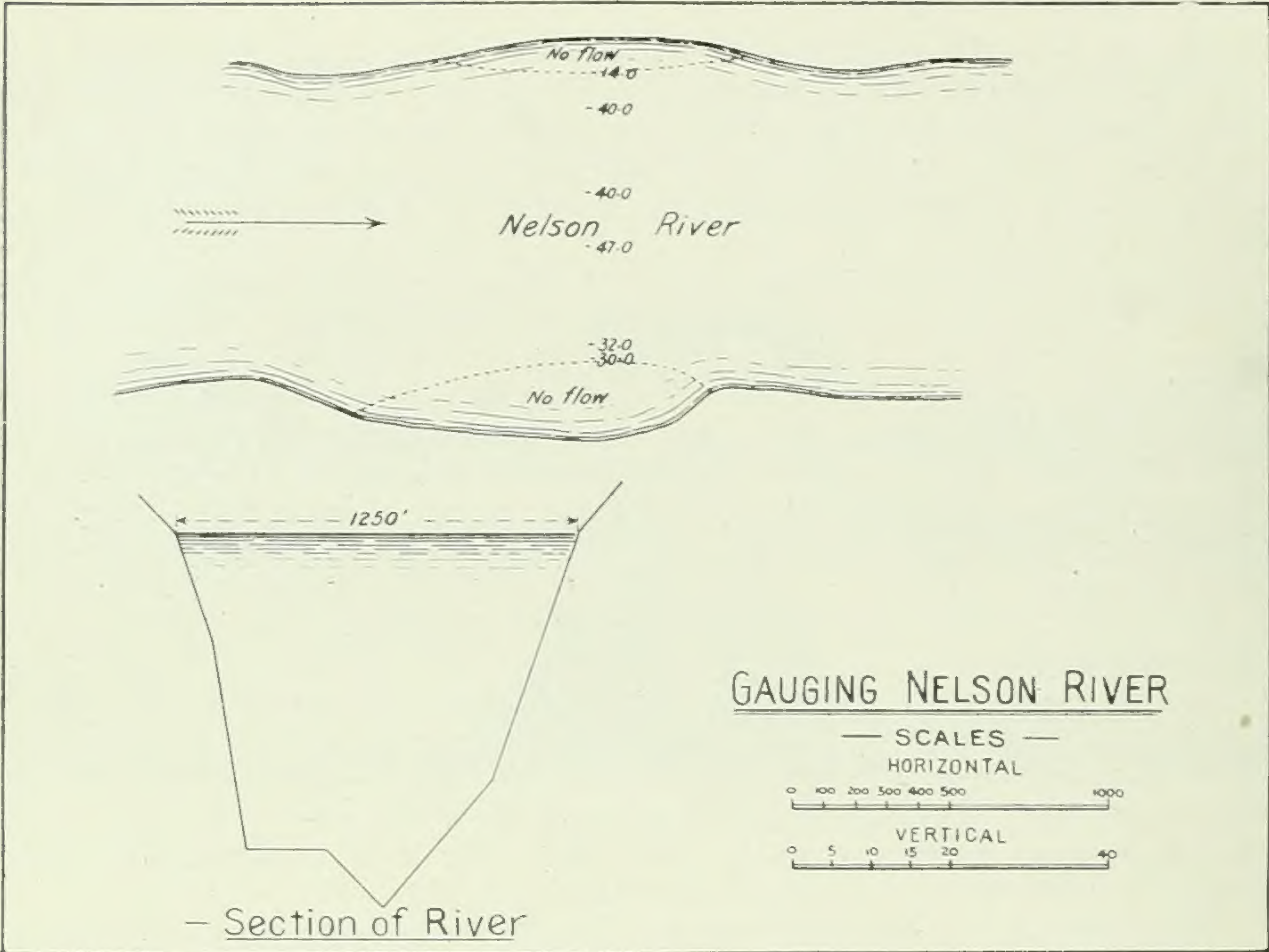
The outlet from Cross lake is blocked by two large islands, forming three distinct channels. The first rapid encountered on the channel, used as the York boat route, is Ebb and Flow rapid. The rapid is about 2,400 feet long and has a total fall of 11 feet. The channel at the head is about 500 feet wide and the banks are about 12 feet above the upper reach.

From the foot of Ebb and Flow rapids to White Mud falls, a distance of about four and a half miles, channel is 600 to 800 feet wide. No soundings were obtained less than 20 feet. The banks show 10 to 12 feet, and the current is not too strong for navigation.

White Mud falls are located at a bend in the river, where the channel is also divided by an island. The total drop is 30 feet.

From White Mud falls to Bladder rapids is a distance of eight miles. Channel about 500 feet wide, with deep water (over 20 feet). Side banks show 15 to 25 feet, gradually rising behind. In several places between these two rapids, the current exceeds four miles an hour. The total fall in Bladder rapids is 10.6 feet, and at this place the waters of the Nelson river are all in one channel for the first time.

About two miles below Bladder rapids the river divides, the west channel flowing to Sepewesk lake, by way of Duck lake. The York boat route follows the East river; the first rapid encountered being Over the Hill rapids which has a fall of 95 feet. The distance from Bladder to Over the Hill rapids, is about seven miles. All soundings taken were over 20 feet, the current in places exceeding four miles an hour. Side banks rocky, and from 25 to 35 feet high.



GAUGING NELSON RIVER, OUTLET TO SEPEWESK LAKE.

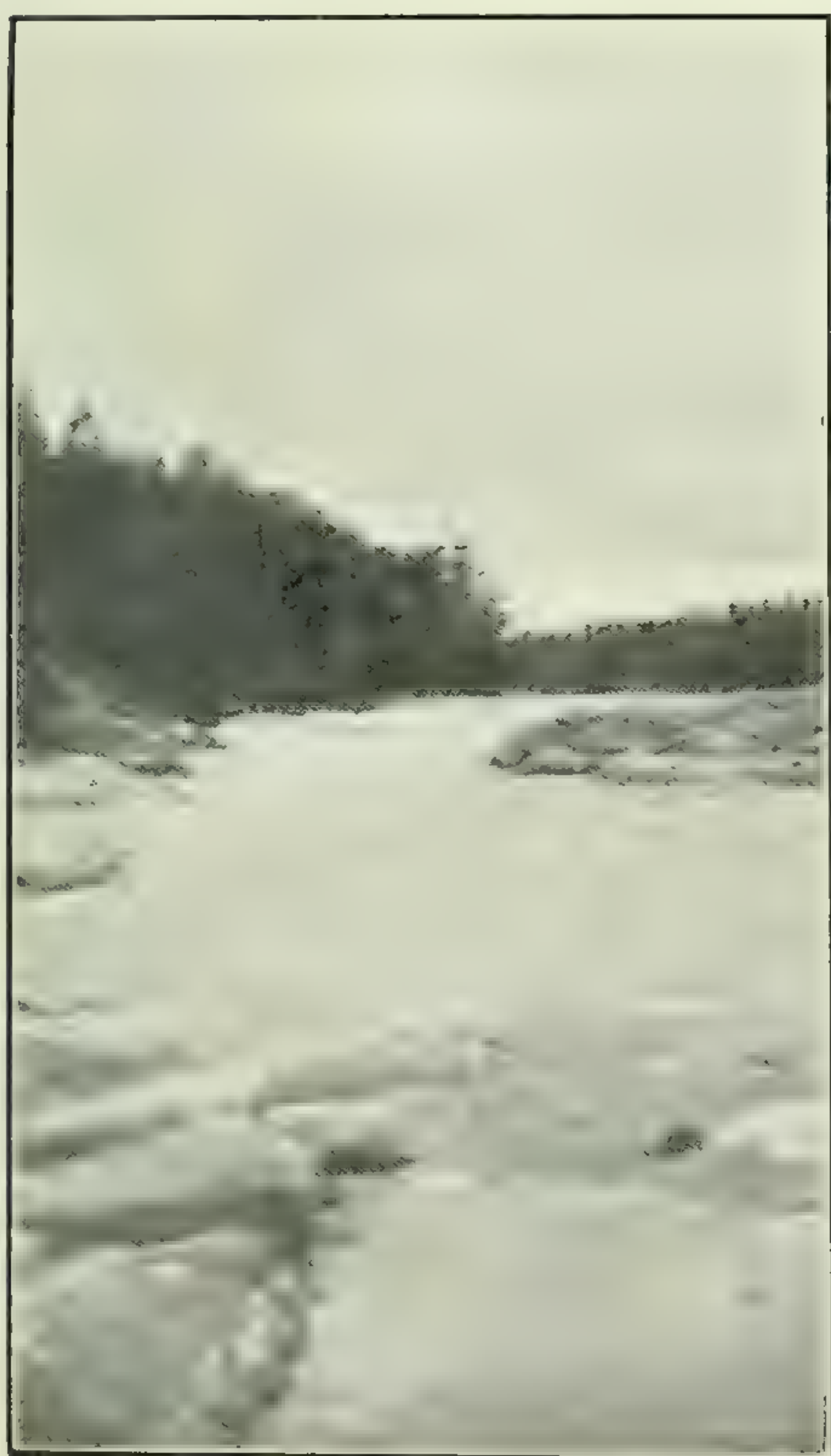
WEDNESDAY, OCT. 6, 1909.

Distance from Initial Point.	Depth.	Depth of Observations.	Time in Seconds.	Number of Revolutions.	Mean.	Revolutions per Second.	Velocity per Sec. in Feet.	Mean Velocity.	Width.	Mean Depth.	Mean Velocity at Mean Depth.	Area.	Dis-charge.
Deg. Min.	Ft.	Ft.							Ft.			Sq. ft.	Cub. feet per sec.
16 34	30	4	30	0	0	0	0						
18 02	32	4	30	27-55-39	40.3	1.343	.78	.39	24.31	.342	.744	744	254.4
37 32	47	3	30	285-300-270	285	9.5	5.52	3.15	318.39.5	2.763	12561	12561	34506.0
46 43	40	3	30	295-255-258-276	271	9.033	5.248	5.384	173.43.5	4.723	7525.5	7525.5	35542.9
54 12	40	3	30	210-202-200	204	6.8	3.95	4.53.9	266.40	4.031	10640	10640	42921.7
62 04	14	3	30	0	0	0	0	1.975	110.27	1.732	2970	2970	5144.0
Total Discharge.....													118369.0

N.B.—Old water marks, on rock, 4.75 ft. higher.



Sea River Falls. (West Fall.)



Typical Scenery through East Branch, south of Pipestone Lake

1 GEORGE V., A. 1911

Red Rock rapids is the next large rapid, distant from Over the Hill, about three and one-half miles. A small chute of two feet fall is also found between the two. All soundings taken were over 20 feet, the channel is wide and the banks about 35 feet high. The total fall in Red Rock rapids is 10.5 feet.

Below Red Rock rapids, the channel is wide (about 2,000 feet) and all soundings were deep. The fall in the next rapid, Chain of Rocks, is 1.2 feet, the channel being blocked by a chain of small islands.

Leaving Chain of Rocks rapids, the channel gradually expands into Sepewesk lake. Cut clay shows on both sides from a few feet above water. East bank, about 50 feet high. Sepewesk lake is very picturesque, being dotted with small islands 10 to 12 feet above water and covered with evergreens. Some of the spruce on these islands are as large as 15 inches at the butt.

About half way down the lake, where the islands are numerous, the current becomes very strong, and again at the east end of the lake the current is bad.

The shallowest sounding obtained was 15 feet. Islands all show rock. At the east end of Sepewesk lake the Nelson river again comes into one channel of about 2,000 feet in width.

At the entrance to the river, the banks show +15 to +20 feet with higher ground behind, rock with clay on top on both shores. Three or four miles further down, the banks are higher, the west shore being principally rock, the east shore showing more clay, both running up to 50 or 60 feet. The soundings were all deep, but the channel in some places narrows to about 800 feet, and here the current exceeds four miles an hour.

From the outlet of Sepewesk lake to Devils Narrows rapids is a distance of 55 miles. Devils rapids and Devils Narrows rapids have a total fall of 5.7 feet. Devils rapids run through a rock gorge of about 400 feet at narrowest part.

From Devils rapids to Grand rapids, a distance of 16 miles, the water is deep, the banks are rocky on the west shore and clay on the east. Both shores are high (+70') a short distance back from the water.

At Grand rapids, the total fall is 20 feet and is found at a sharp bend in the channel. From Grand rapids to Chain of Islands rapids, the distance is four miles. The banks just below Grand rapids run up to about 70 feet on the west, the east shore being irregular, while just above Chain of Islands rapids the banks are rocky and about 30 feet above water. The fall in Chain of Islands rapids is 4.6 feet and about two miles below the rapid, the river expands into Split lake. The shallowest sounding obtained in the lake was 18 feet, but bad currents are found at the east end near the outlet. The Hudson's Bay Company's post is located on a sandy point (+35) about half-way down the lake, where the canoe route to Churchill leaves the Nelson. The islands in the lake all show rock.

About three miles from the outlet of Split lake the rapids begin again. The total fall, in rapids, to Gull lake is 29.4 feet, the distance being 15 miles. The shores, near the river, are low, but higher ground was found (+40) below Birthday rapids, a short distance back.

The current is strong all through Gull lake and at several places exceeds four miles an hour. All soundings taken were over 18 feet.

Gull Lake rapids are the first below Gull lake. At the beginning of the rapids the main channel is expanded and filled with islands, but narrows to about 2,000 feet farther down. The total fall is 67 feet.

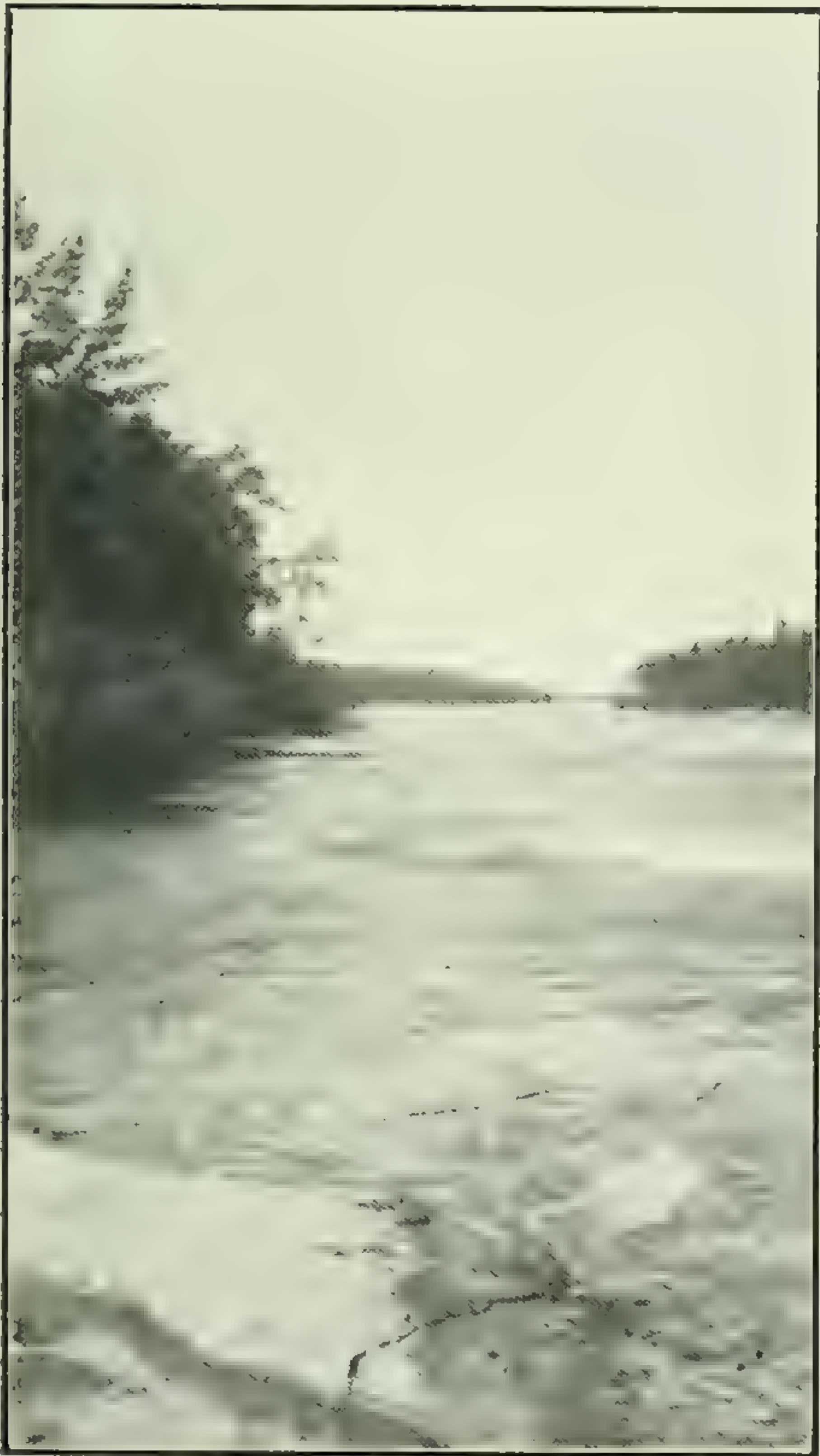
From Gull rapids to the first pitch in Kettle rapids is a distance of about 17 miles, with a couple of small chutes occurring between. The banks show cut clay to about 50 feet.

At the head of Kettle rapids, the river is again divided by islands into several channels, but narrows in a couple of places before the foot of the rapids are reached.

EBB AND FLOW RAPIDS.



Looking up Rapid.



Looking down Stream from Head of Rapid.

WHITE MUD FALLS.



West Fall.



East Fall.

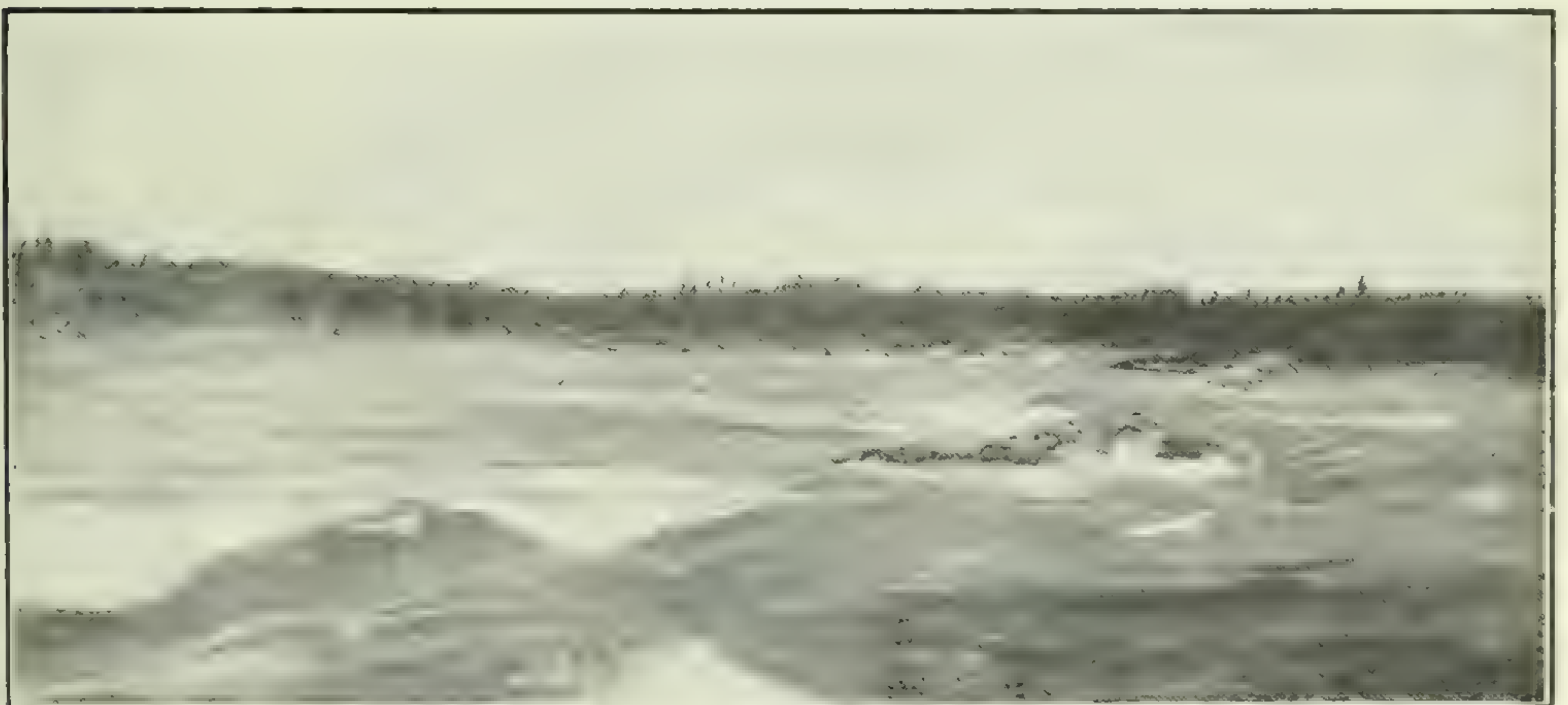
BLADDER RAPIDS.



Looking Down Stream.



Looking Up Rapid.



Looking Across 1st Pitch.



Over the Hill Rapids.



Two Views



Red Rock Rapids.

SESSIONAL PAPER No. 19b

The main banks of the river are good, and from the foot of Kettle rapids the river runs through cut clay banks, which in some places are as high as 120 feet. These high banks continue on the west shore to Hudson bay and on the east shore to Seal islands. Solid rock is always seen along the shores of rapids and many projections of the shore line show rock.

From Kettle rapids to the 'Extreme Head of Navigation' are two rapids, Long Spruce (fall +85.5') and Limestone (fall +85.2'). A great many rocky islands and reefs are exposed in Long Spruce rapids.

The point known as the 'Extreme Head of Navigation' is about 50 miles, up the river, from Seal islands, or 75 miles from Hudson bay. The current in this piece of river is very strong throughout, and although the shallowest water sounded was 12 feet, many gravel bars are to be found in the channel.

In the upper part of the river, the banks are generally low and the river is more suitable for diversions by means of canal and locks, than by means of dams and raised water levels. Proposed locations for these diversions have been roughly investigated, the results of which are incorporated in the following sheets.

In the lower part of the river, which naturally lends itself to the lock in combination with dam and raised water level system, no details have been worked out owing to limited time at our disposal, beyond observations as to, height of banks, width of channel, fall in rapids, and soundings wherever possible.

Details of Location.

Playgreen lake and the West river have already been navigated, as far as Whisky Jack Portage, by a tug drawing six feet of water and having a maximum speed of seven miles an hour. Several rock shoals are found in the lake at the south end, but not for any continuous distance. Even in Lake Winnipeg, a short distance from the mouth of the river, a small shoal is found in the channel over which a boat drawing nine feet cannot pass, without touching, when the water is low.

About six or eight miles from Whisky Jack a shoal is found extending across the channel. The deepest water found on this shoal is eight feet, but the bottom is gravel and boulders.

Two miles from Whisky Jack, the channel is narrow and the current is very strong but the water is deep and a boat with a speed of 10 miles an hour would have no difficulty.

The river, from the end of Playgreen lake to Cross lake, in which the rapids occur, was not seen by the writer, but Plate No. 2 shows a profile of ground between Playgreen lake and Cross lake. The distance is about four and a half miles and would be the shortest possible route from Lake Winnipeg to Cross lake. No rock was seen at the south end of the Portage, or above the elevation of Playgreen lake, at any point on the Portage. (The difference in elevation of the two lakes is between 45 and 50 feet.)

By raising the elevation of Cross lake about five feet, no dredging would be necessary and the current would be slack to the head of Ebb and Flow rapids.

To do this, a dam would be constructed at the head of Edd and Flow rapids and also in the other two channels leading from Cross lake, just above the first rapid in each.

Plate No. 3 shows Ebb and Flow rapids. From information obtained, the writer judges the other two channels to be about the same size.

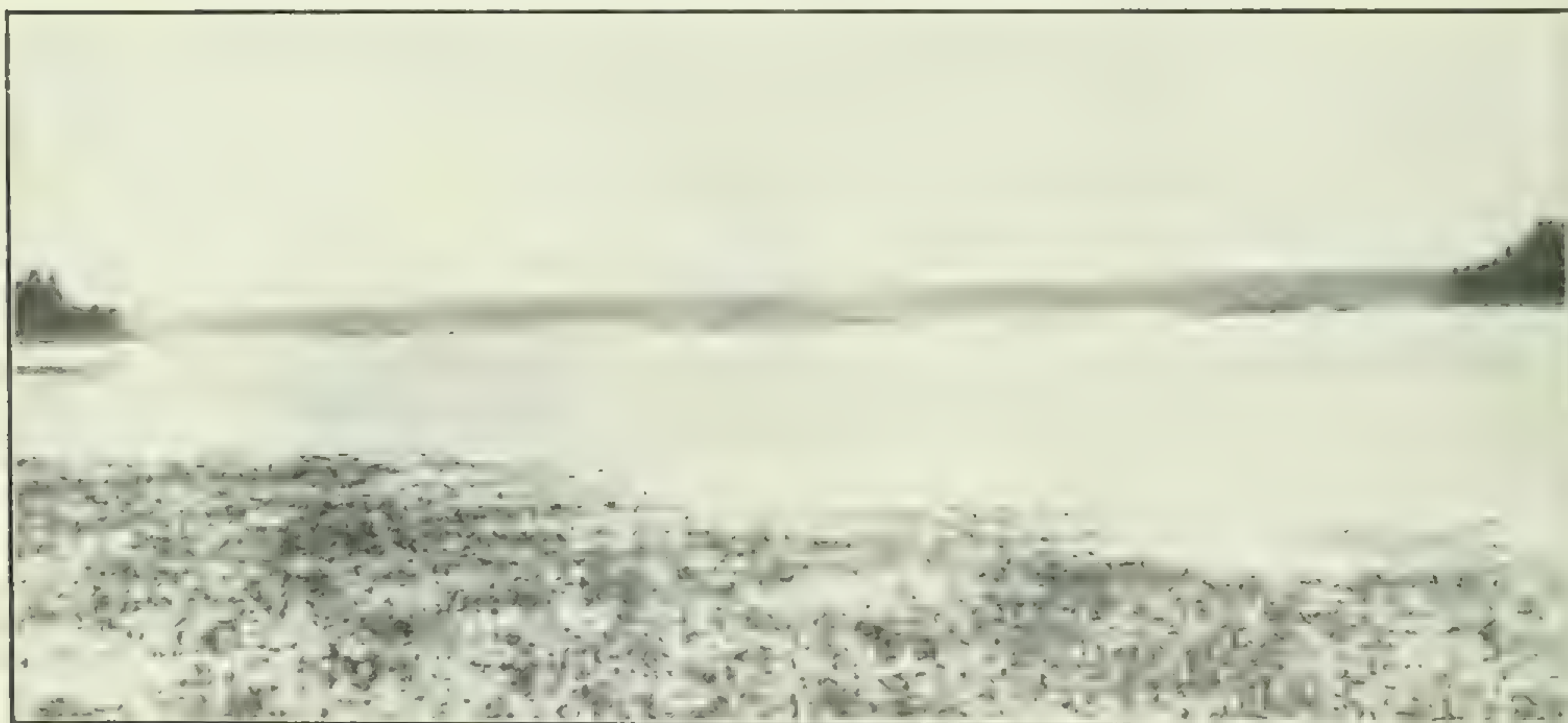
A diversion of about 2,500 feet would here be necessary together with the lock and dams.

From Ebb and Flow rapids to White Mud falls no improvement is necessary and it is therefore not necessary to dam the river above the rapid.

Plate No. 4 shows the location.



Chain of Rocks Rapids. (From below Fall.)



Chain of Rocks Rapids. (From above Fall.)



Typical View Sipe-wesk Lake.



Two Views of River between Se-pe-wesk Lake and Devil's Narrows Rapids.



Devil's Narrows Rapids.

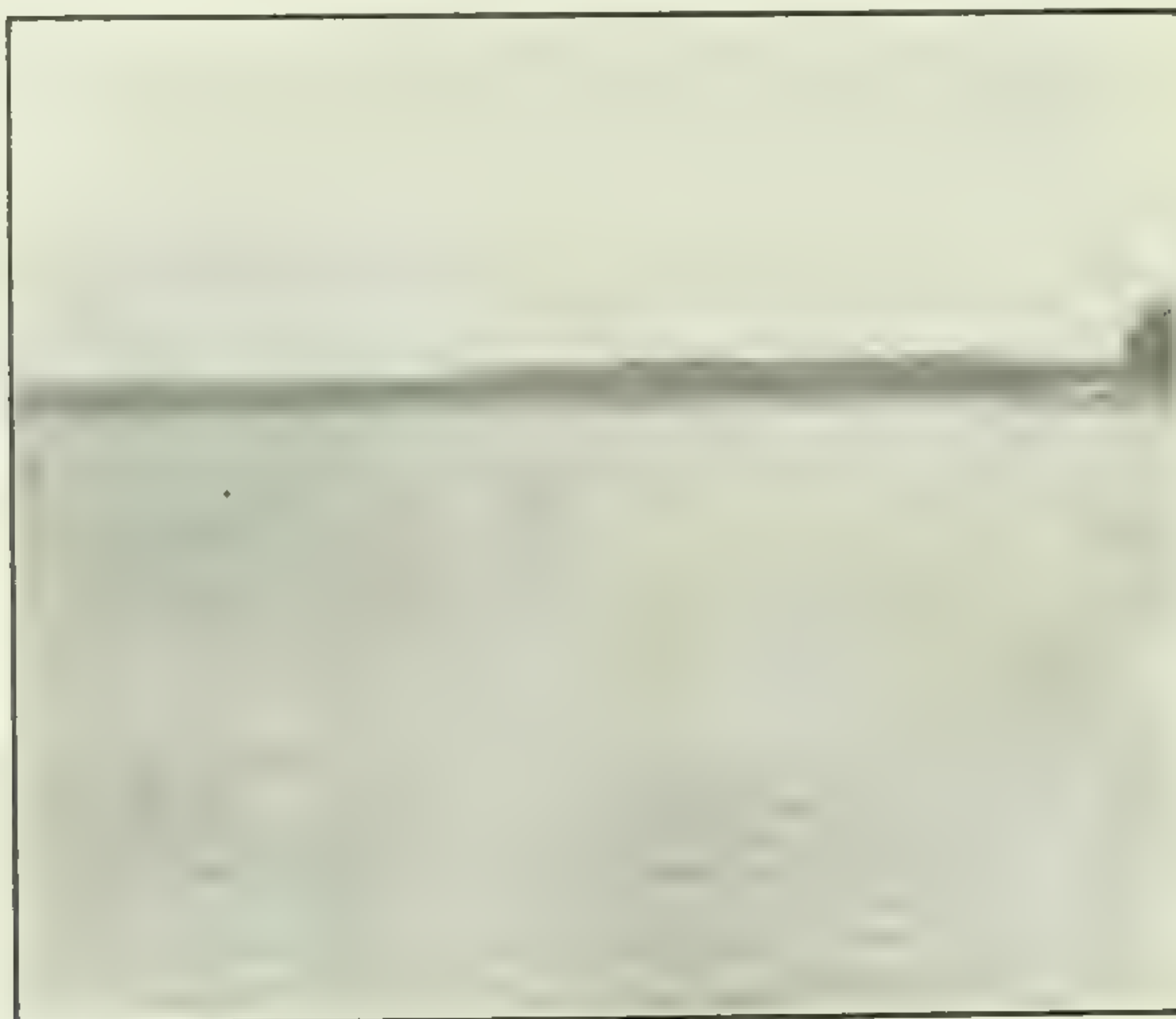
GRAND RAPIDS.



1st Pitch.



Looking Down Stream from Below 1st Pitch.



Looking Down Stream from North End of Portage.



Hudson's Bay Co.'s Store, Split Lake.



Cree Indians.



Birthday Rapids. Looking up River.



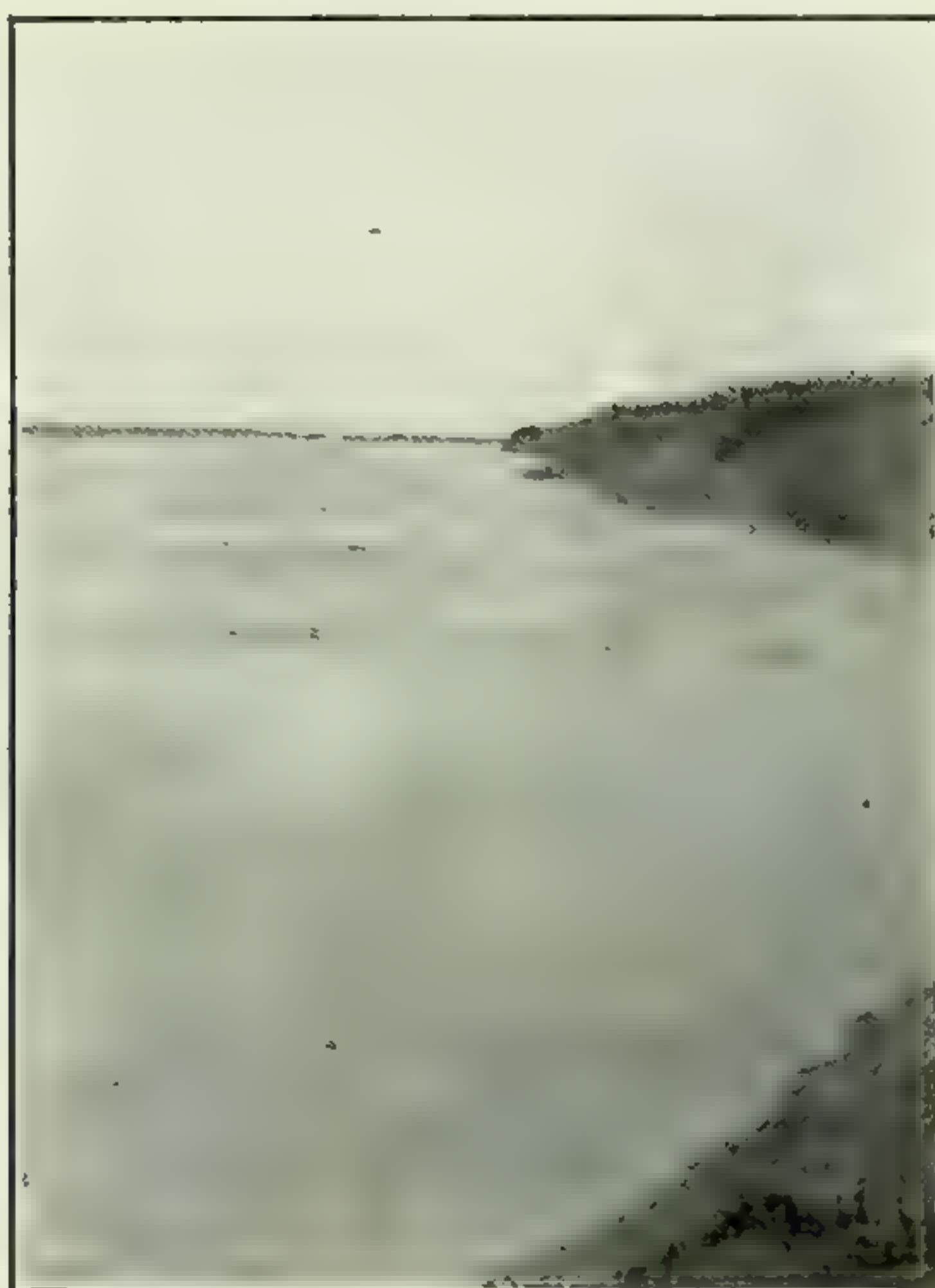
Foot of Gull Rapids.



1st Rapid above Moose Nose Point.



Long Spruce Rapids.



Looking up Limestone Rapids. From 1st Point above Limestone River.
(High Banks are Cut Clay.)



Kettle Rapids.



Two Views of Clay Banks at 'Extreme Head of Navigation.'

YORK FACTORY.



Main Depot.



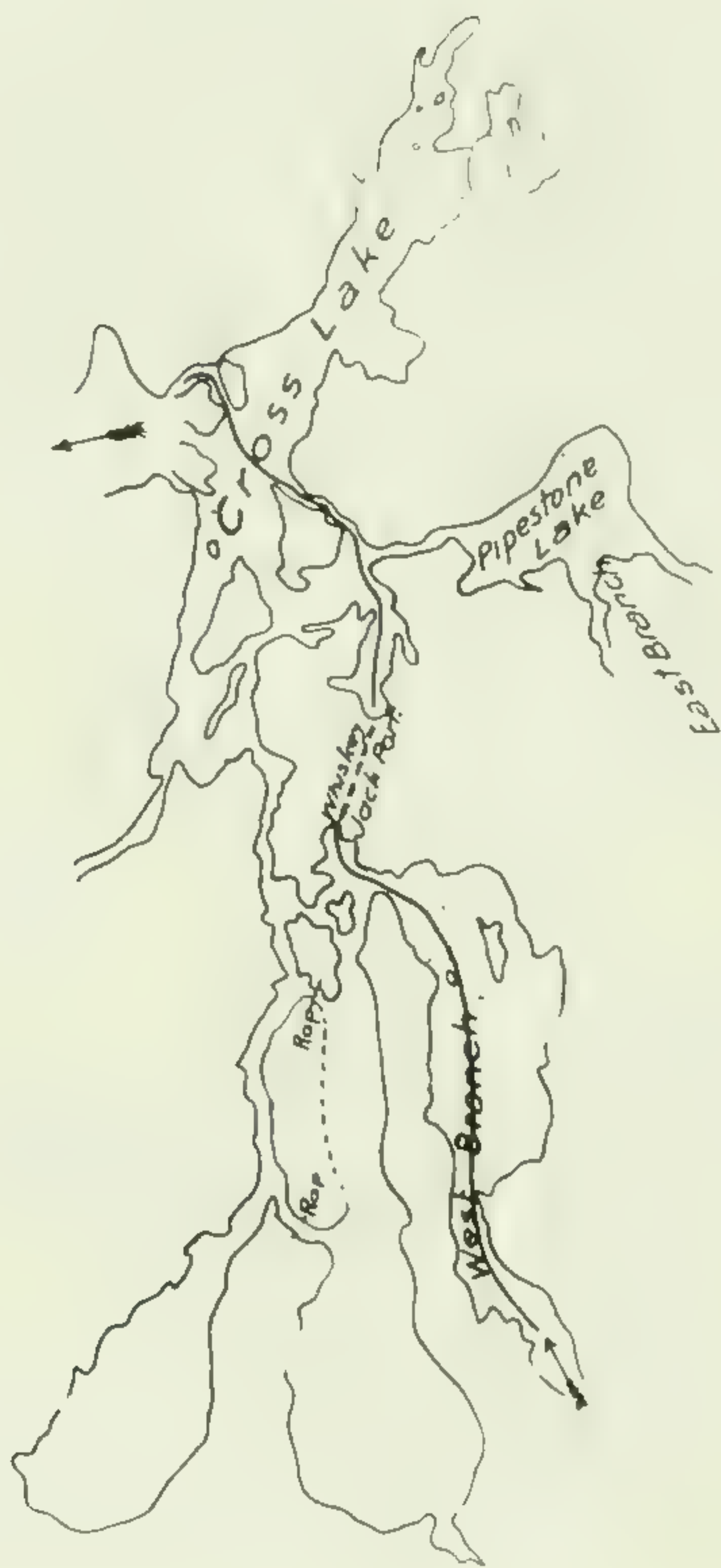
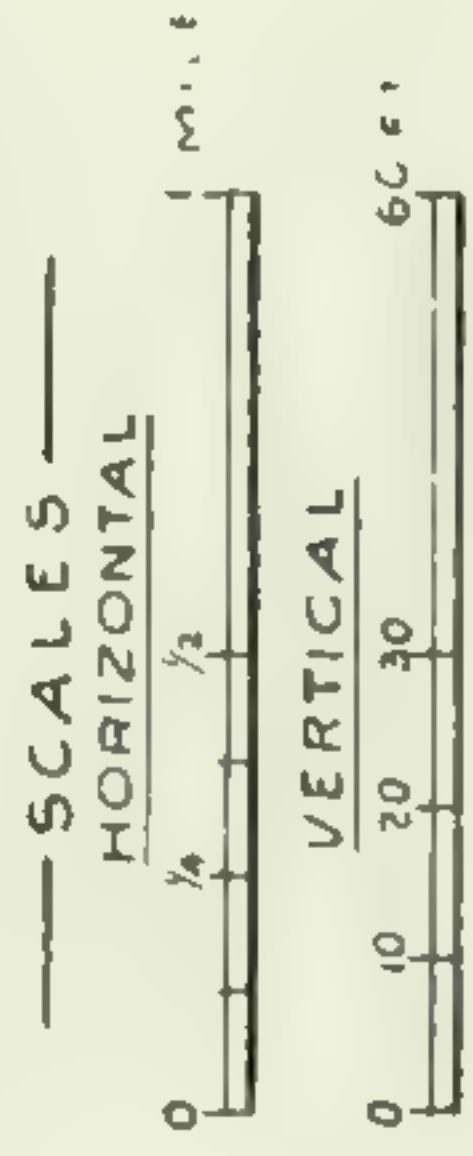
Old Cannon.



Church.

PLATE No. 2.

WHISKEY JACK PORTAGE



1150 Sandbar top

1710

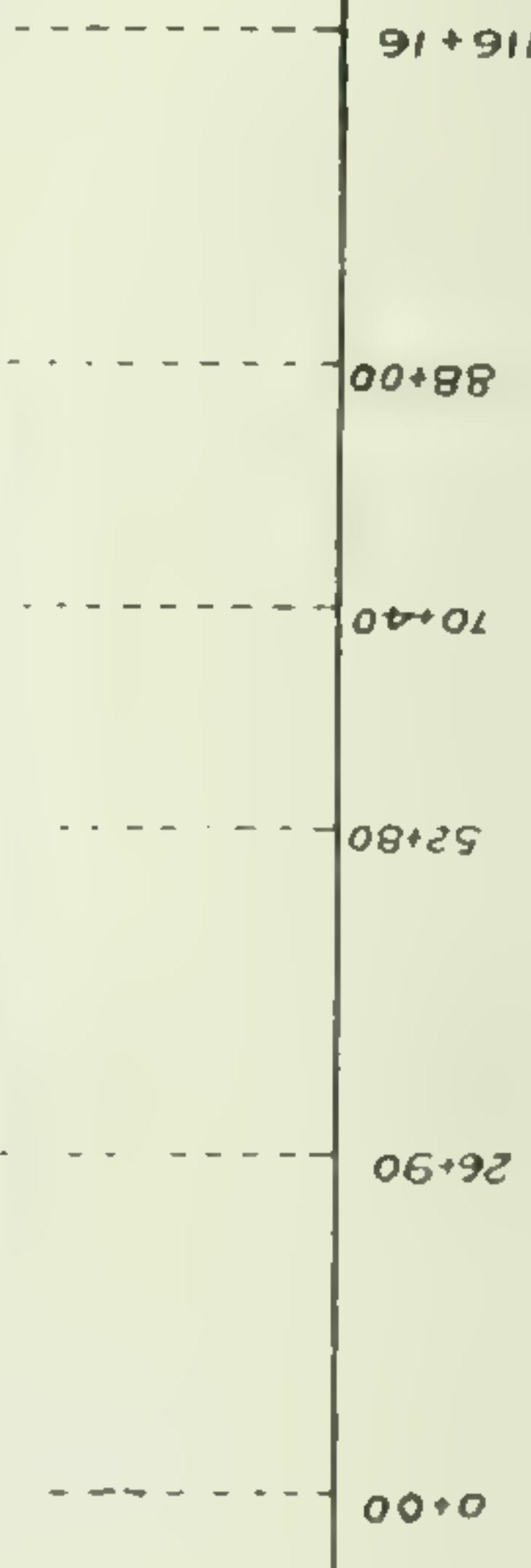
No rock showing

7200

PLAYGREEN LAKE
Elev 700

Regulated W.S. Elev 100.0

Bottom of Channel Elev 686.0



LOCK, LIFT 25 FT

Regulated W.S. Elev 675.0
Bottom of Channel Elev 661.0

N.B. Rock showing to west Elev 687.0

LOCK, LIFT 20 FT

Regulated W.S. Elev 655.0
Cross Lake Elev 650.0
Bottom of Channel 641.0

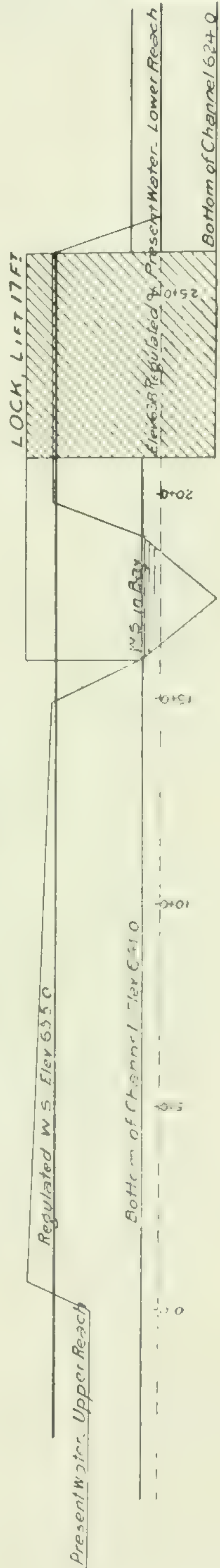
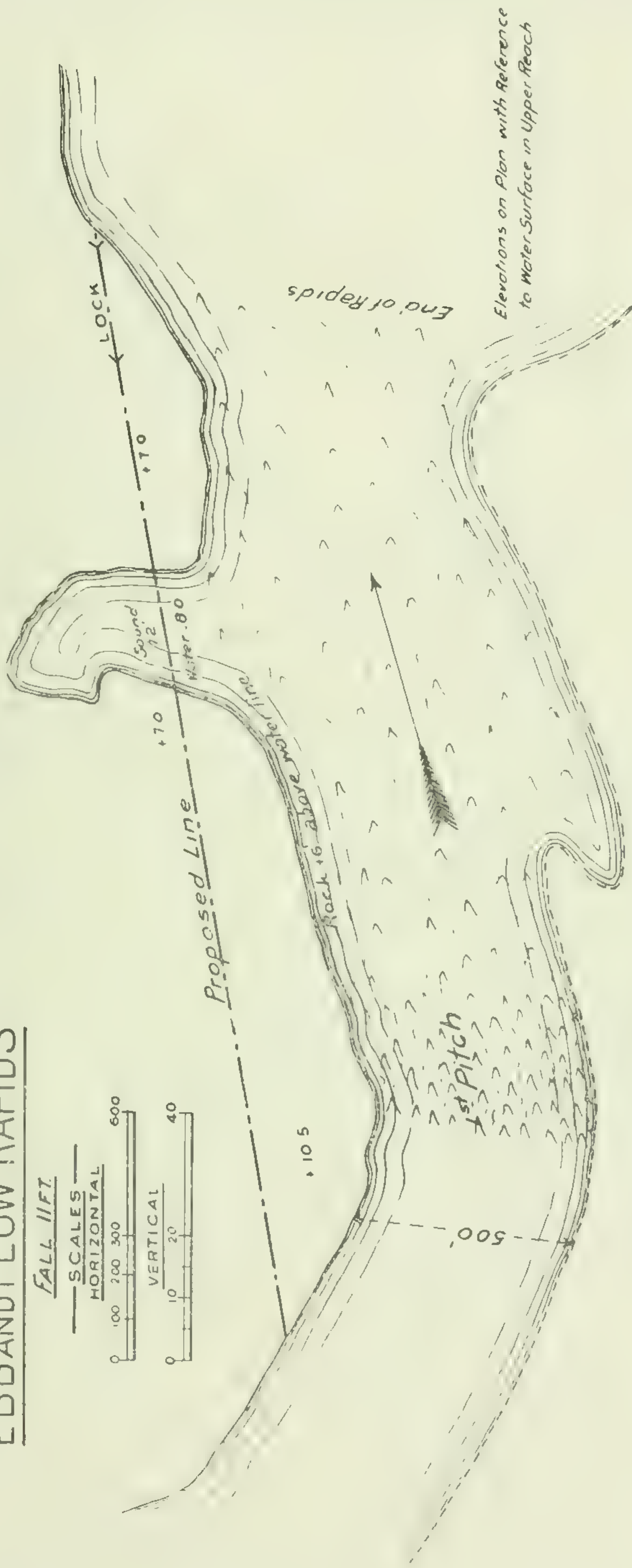
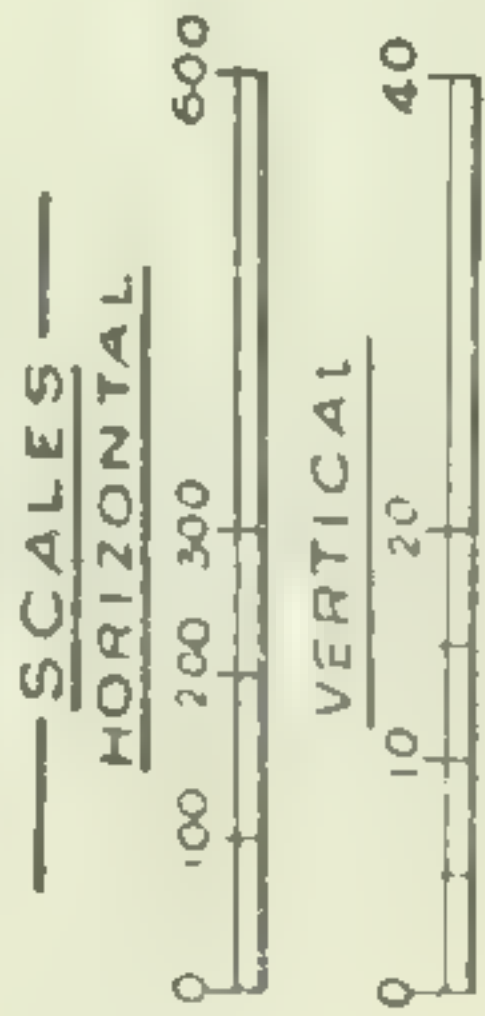
264+00

SESSIONAL PAPER No. 19b

PLATE No. 3.

EBBANDFLOW RAPIDS

FALL 11 FT.



1 GEORGE V., A. 1911

A lock, with a diversion of about 3,200 feet would here be necessary for a good entrance at the lower end.

The currents from White Mud falls to Bladder rapids will necessitate a dam at the head of the latter.

The soundings obtained, about 500 feet from the head of the rapids, are deep but must be much shallower at the first pitch.

The diversion could here be so arranged that the excavation would just be sufficient to construct the dam.

The width of channel to be dammed is about 2,000 feet, with an island of 500 feet in the centre. (See Plate No. 5.)

If a dam at Chain of Rocks rapids (Plate No. 8) to raise the water about 35 feet were next constructed, this would flood out all rapids back to the foot of Bladders rapids. The rapids drowned out would be Over the Hill rapids (Plate No. 6), a small chute just below, and Red Rock rapids (Plate No. 7).

By this scheme, the waters of Sepewesk lake are reached and no rapids are encountered until Devils Narrows rapids are reached, a distance of 90 miles.

A dam and lock will probably be found necessary, somewhere in the river near the outlet of Sepewesk lake, to overcome the bad currents among the islands in the lake. A typical section of the river is the one used in the gauging section (Plate No. 1).

The total fall in Devils Narrows rapids and Devils rapids is about 5 feet, so if a dam were constructed just above Grand rapids (Plate No. 9) to maintain a rise of about 25 feet, Devils rapids would be drowned out and the current slackened in the river behind.

After leaving Grand rapids, one rapid, Chain of Islands, (Plate No. 10), has to be overcome before Split lake is reached. If the river was dammed just above Gull lake, (Plate No. 11), to raise the water at that point about 35 feet, all rapids from Split lake to that point would be eliminated; the elevation of Split lake would be raised about 12 feet, and Chain of Islands rapids would be drowned out.

Currents are found in Gull lake which will have to be eliminated, so the next dam should raise the elevation of Gull lake slightly.

The fall in the last large chute of Gull rapids is about 25 feet, so if a dam is built between this and the next fall above, the water could be raised sufficiently to eliminate the upper half of Gull rapids and raise Gull lake.

From the proposed dam to the end of the 25 foot chute is about 3,000 feet, so with an embankment forward, the next level could be reached with two locks.

The remainder of Gull rapids and the small rapids just above Moose Nose Point could be drowned out by a dam just below Moose Nose point. (Plate No. 13). The banks here are high and the width 1,800 feet.

No rock, however, shows at this point, although rock is seen about one mile farther up river, where the channel is wide and banks, near river, low.

If a dam was next constructed some place at the first Kettle rapids (Plate No. 14), a sufficient rise could be maintained to drown out all rapids as far back as Moose Nose Point.

A rough idea of all locations from here to the mouth of the river, was all that was obtained.

From the last dam to near the foot of Kettle rapids, all rapids could be eliminated by a dam just above the narrow part (Plate No. 15).

With an embankment about three-quarter miles forward, and another lock at the end, 54 feet could be overcome.

The next suitable location for a dam is at the head of Long Spruce rapids (Plate No. 16), and with an embankment of about 2,000 feet, 60 feet could be overcome.

A dam could next be located in Long Spruce rapids. The average width of channel in this rapid is about 2,800 feet, rock shores all through and although no soundings were taken, average water cannot be deep as the current runs very swiftly.

WHITE MUD FALLS

FALL 30 FT.

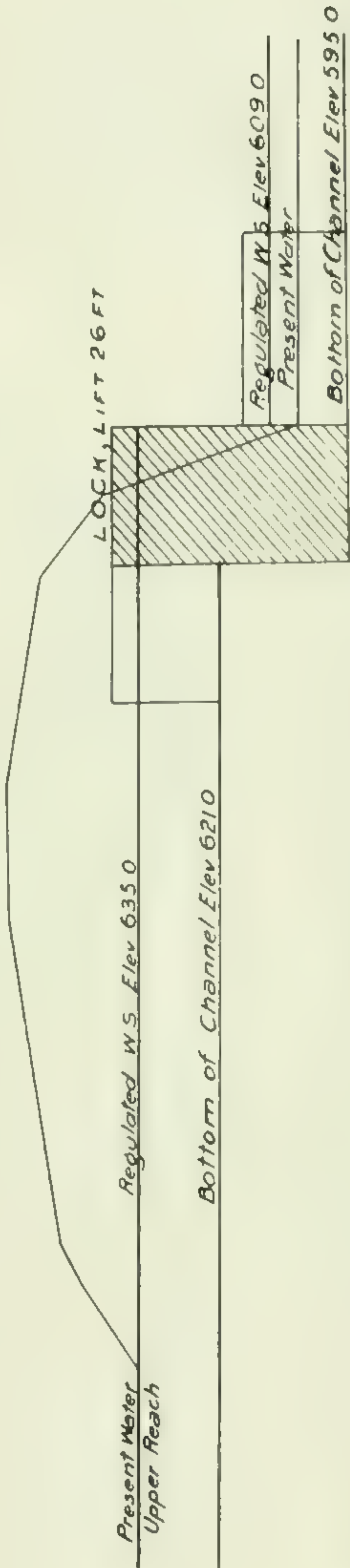
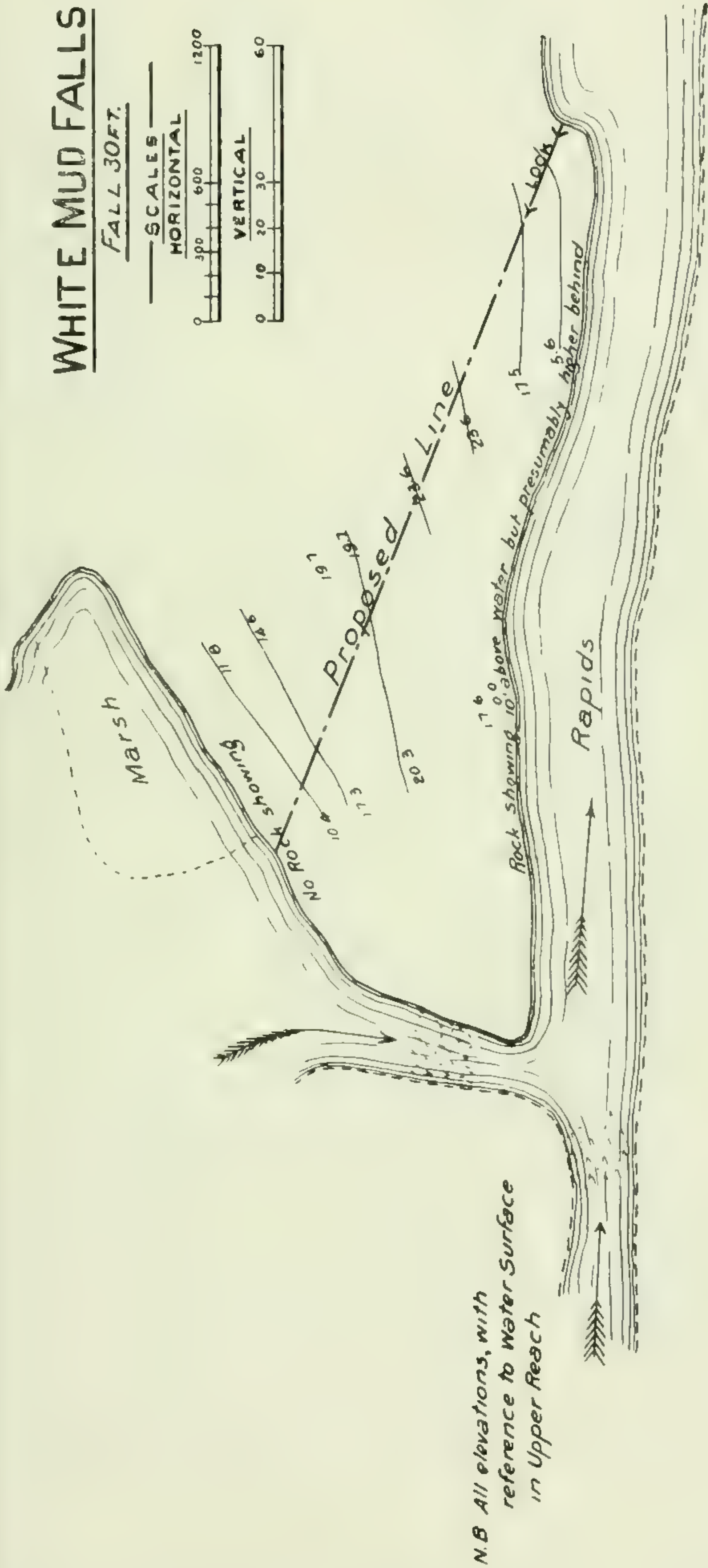
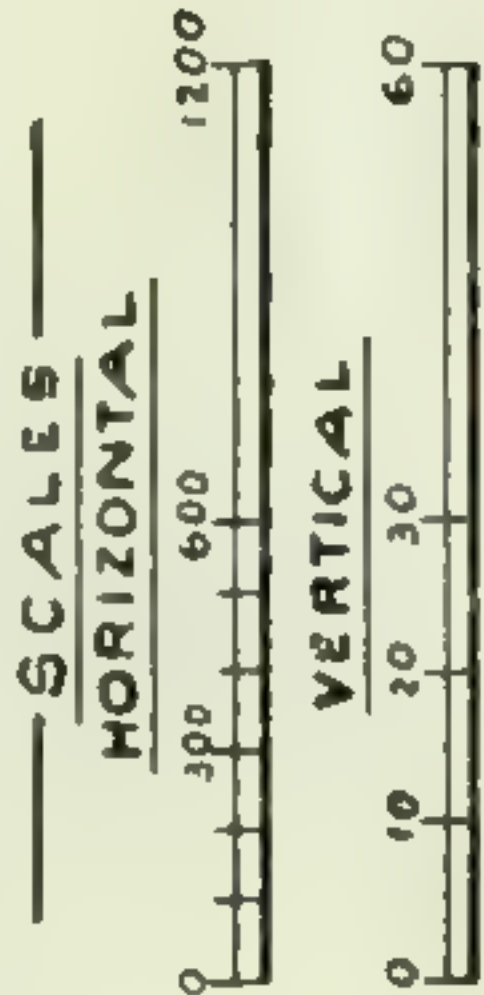


PLATE No. 3.

BLADDER RAPIDS

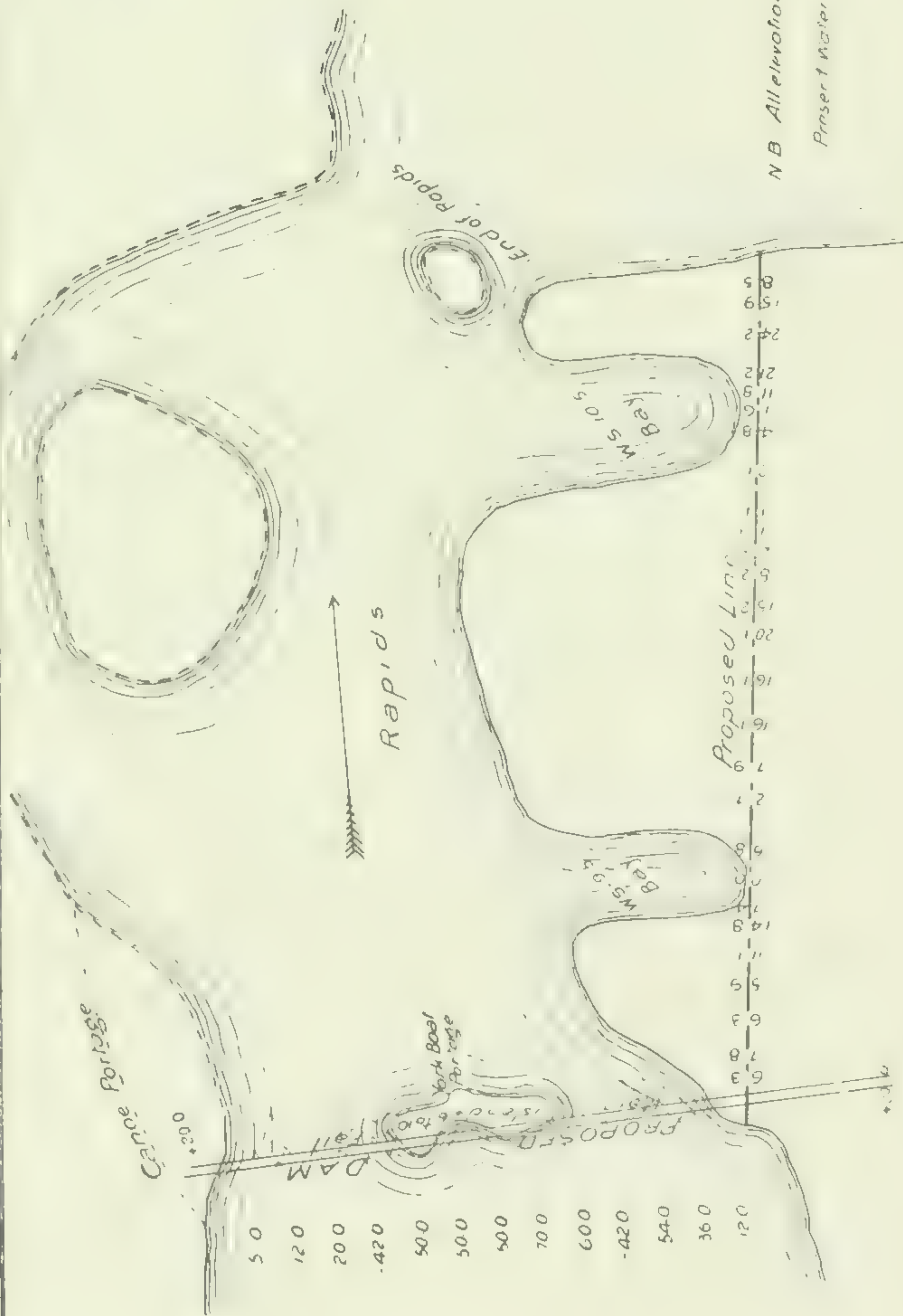
FALL 106 FT

SCALES

HORIZONTAL



VERTICAL



N.B. All elevations, with reference to
Present Water Surface in Upper Reach

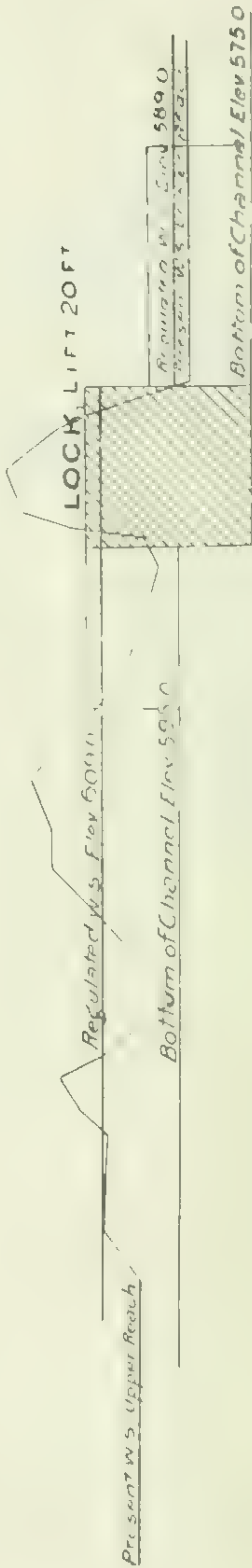


PLATE No. 6.

OVER THE HILL RAPIDS

Drowned out by Dam at Chain
of Rocks Rapids. -- Fall 9.5 FT.



-- N.B. Elevations, with reference to --
-- Present Water surface in upper Reach --

RED ROCK RAPIDS

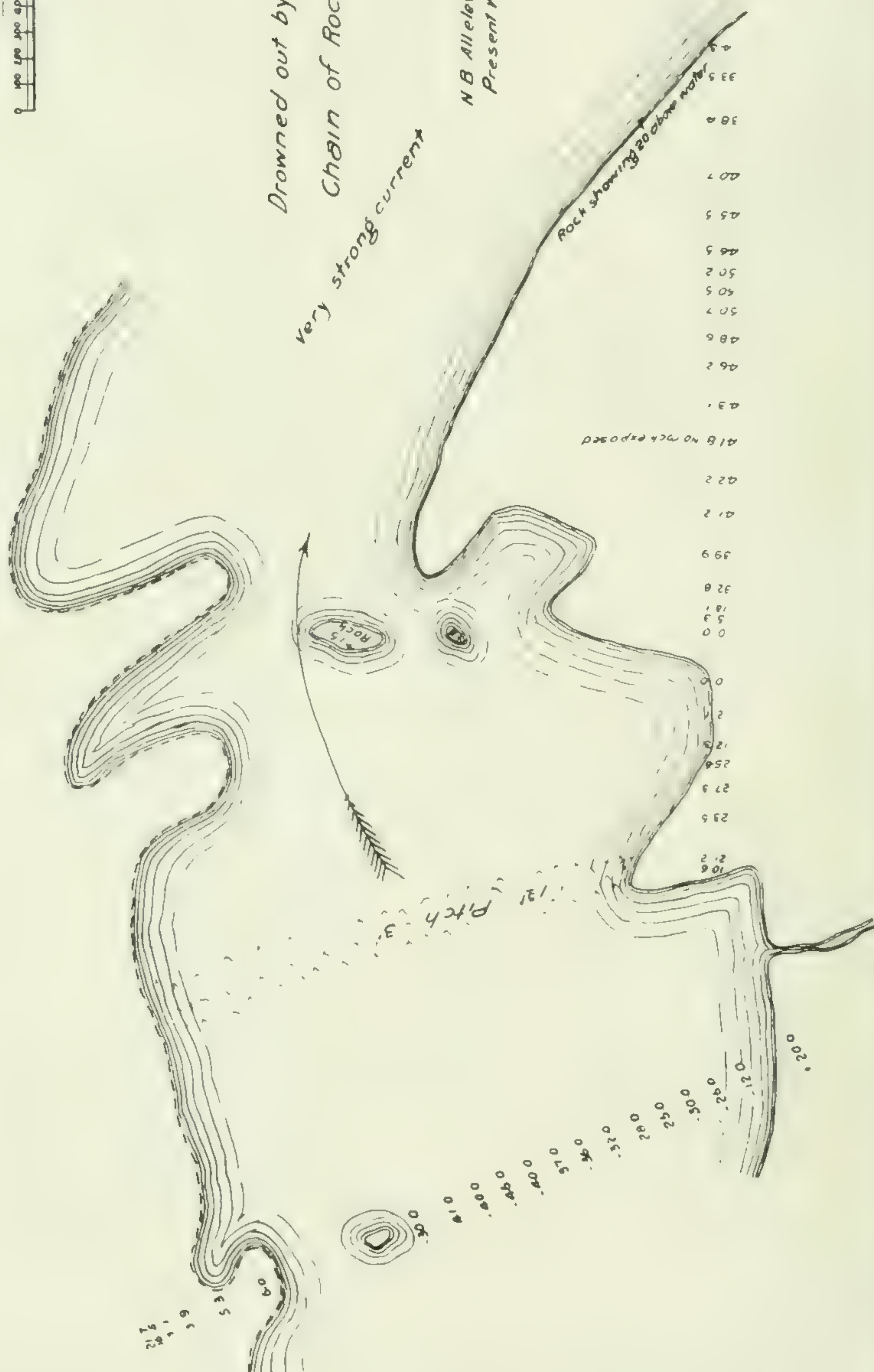
FALL 10557

SCALE



Drowned out by Dam at
Chain of Rocks Rapids.
Very strong current

NB All elevations, with reference to
Present WS in Upper Reach



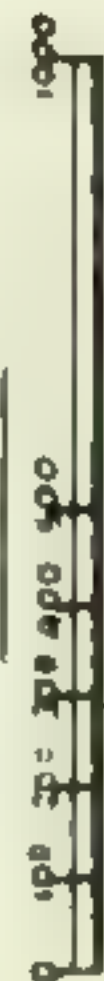
SESSIONAL PAPER No. 19b

PLATE No. 2.

CHAIN OF ROCKS RAPIDS

FALL 1.2 FT.

SCALE



Plan No. 9.

GRAND RAPIDS

FALL 20 FT

SCALES

PLAN



HORIZONTAL



VERTICAL



LOCK, LIFT 45'

Regulated W.S. Elev. 527.0

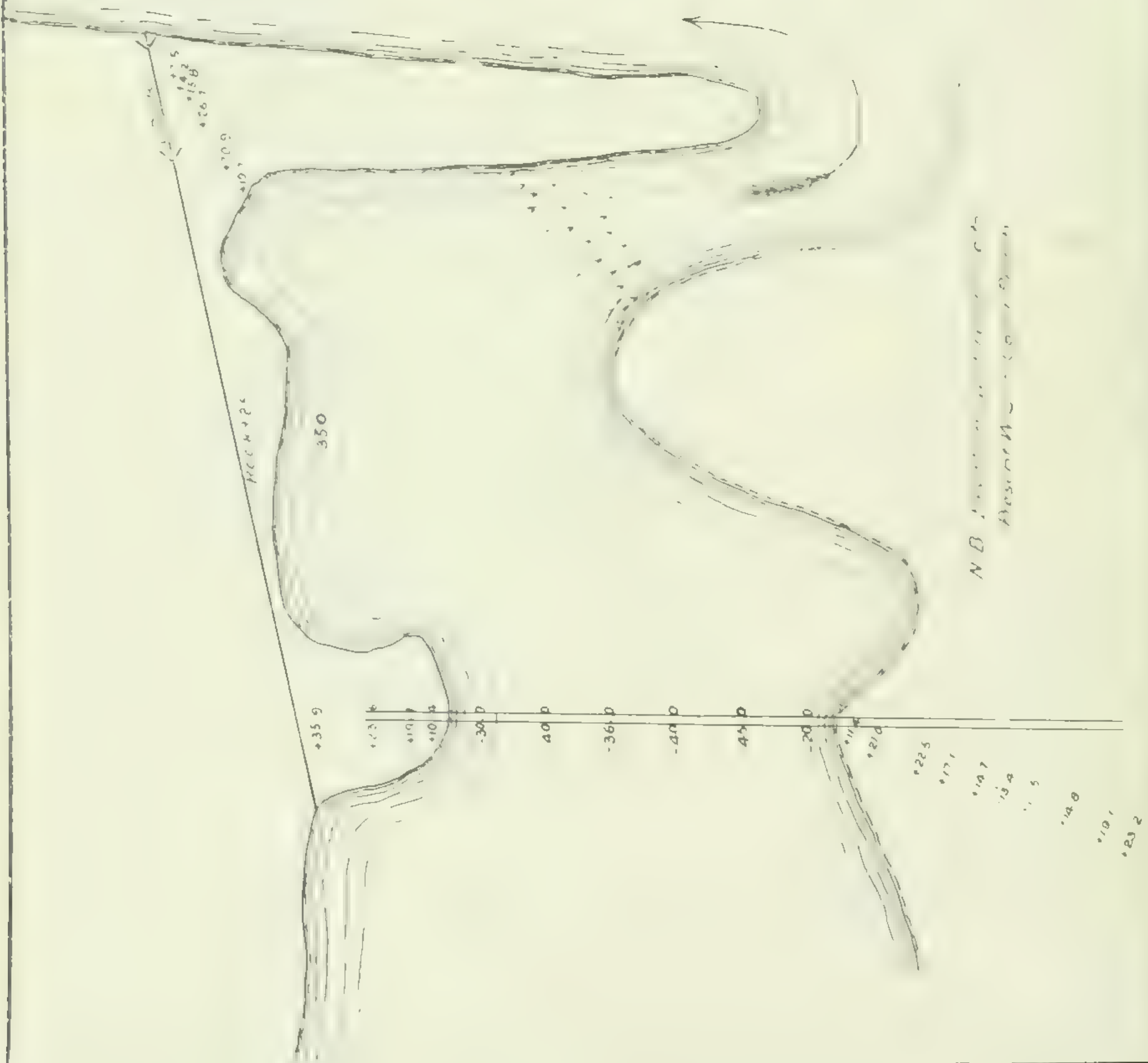
Present W.S.

Bottom of Channel 513.0

Regulated W.S. Elev. 527.0

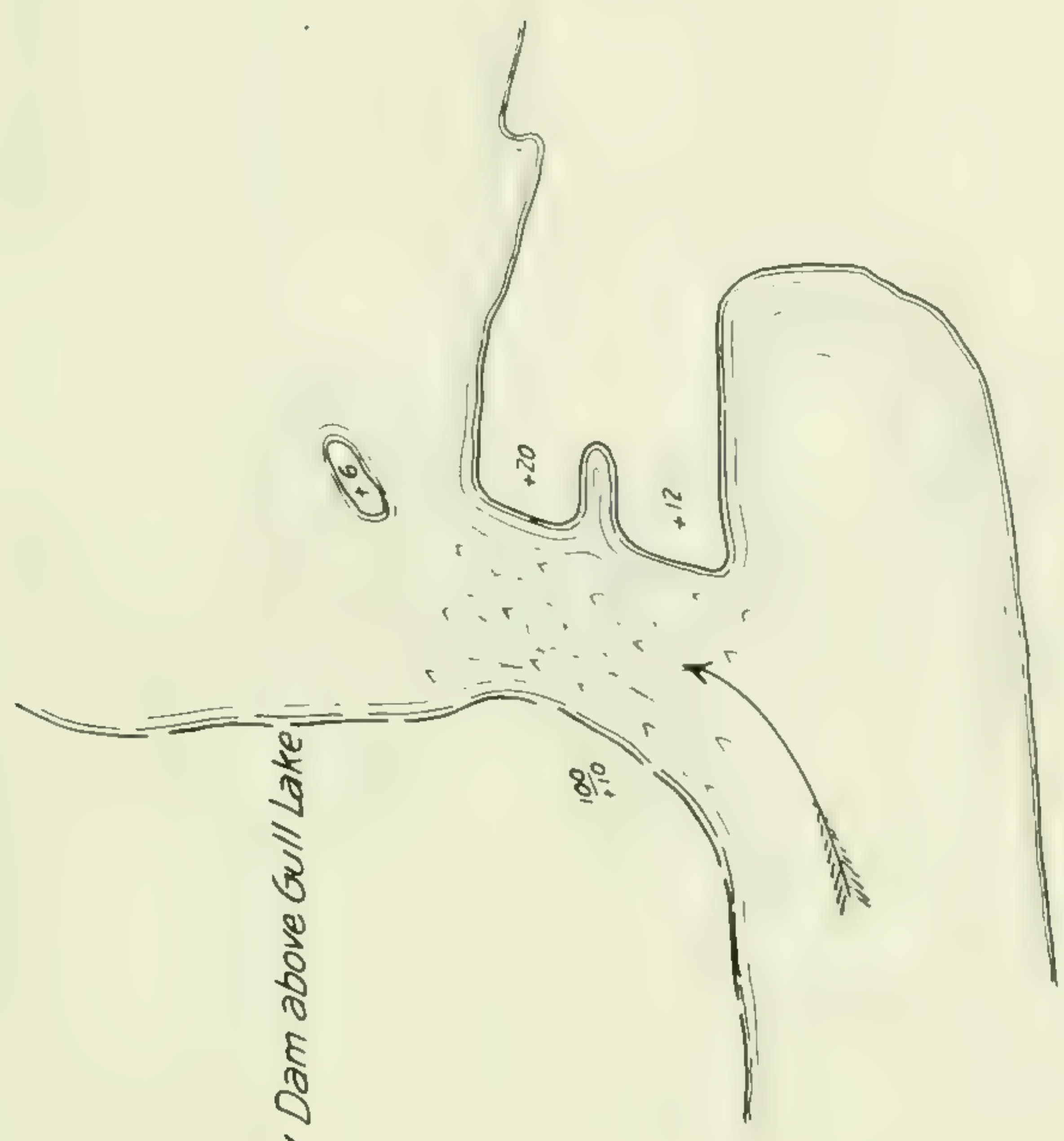
Bottom of Channel 513.0

N.B. Present Channel is 100 ft wide at Lock



SESSIONAL PAPER No. 19b

PLATE No. 10.



Drowned out by Dam above Gull Lake

CHAIN OF ISLANDS RAPIDS

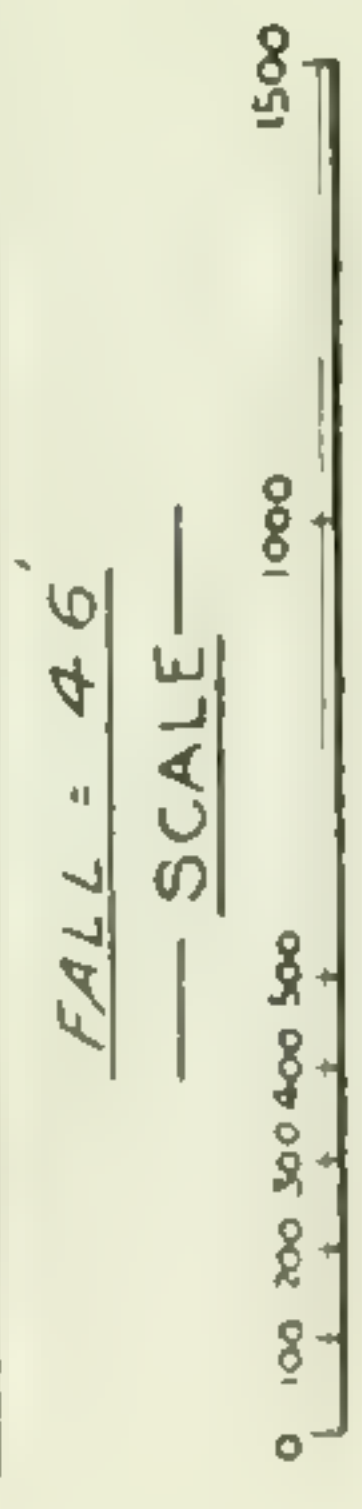
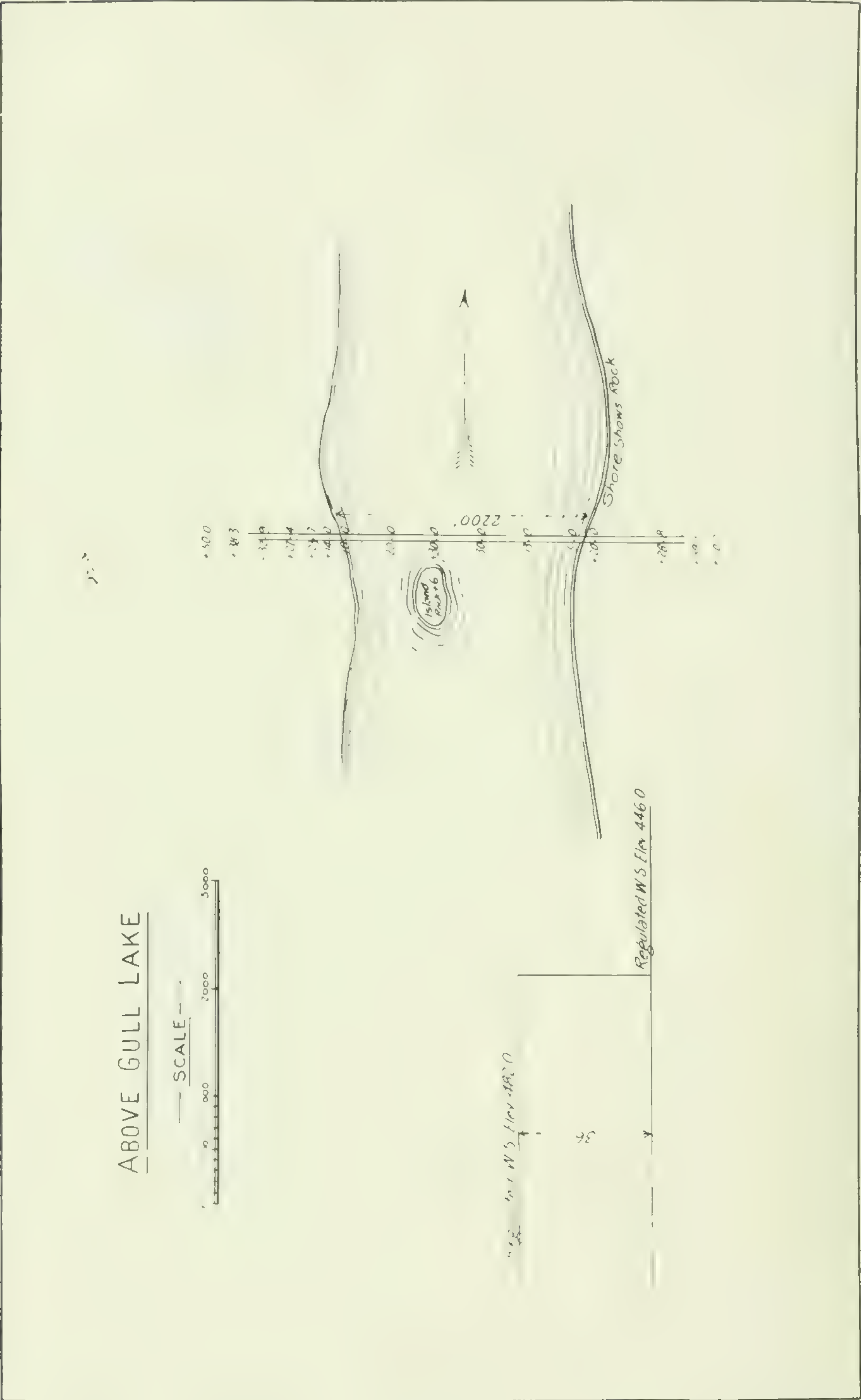


PLATE NO. II



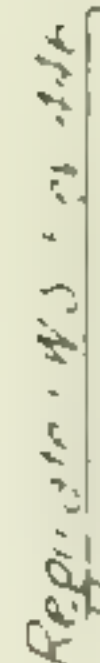
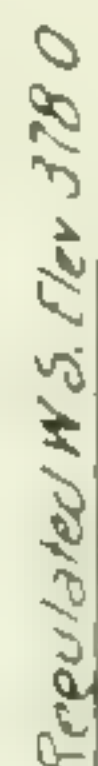
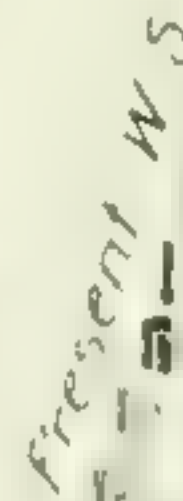
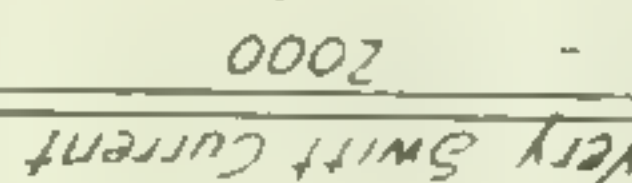
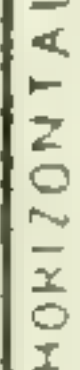
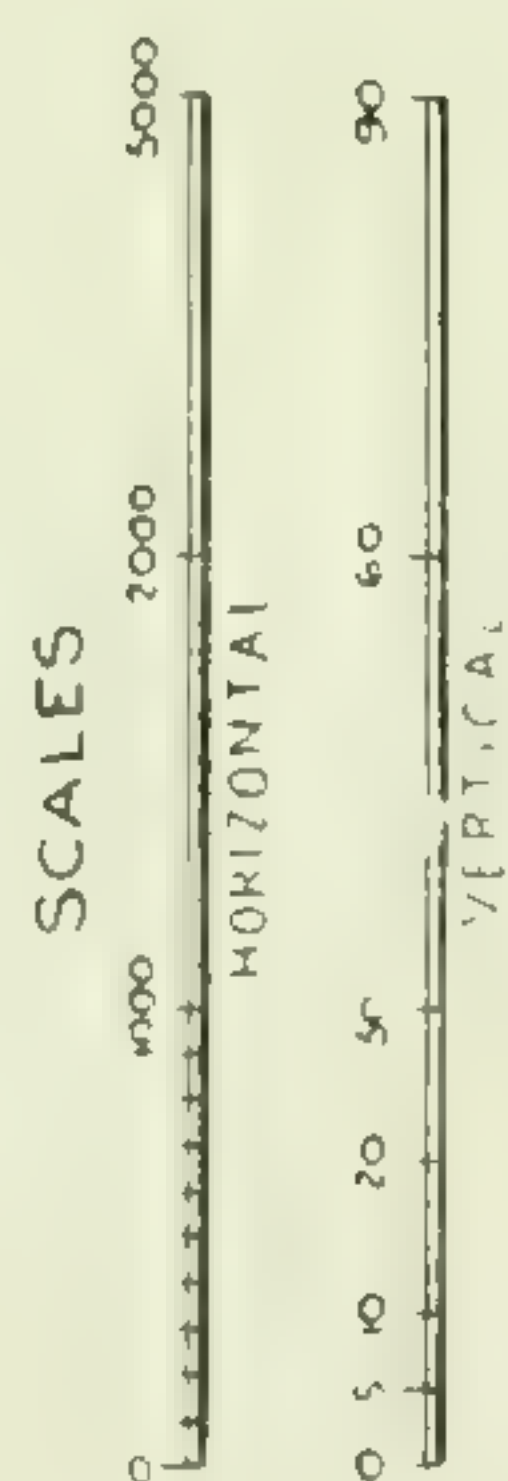
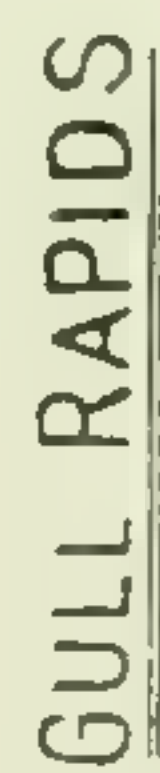
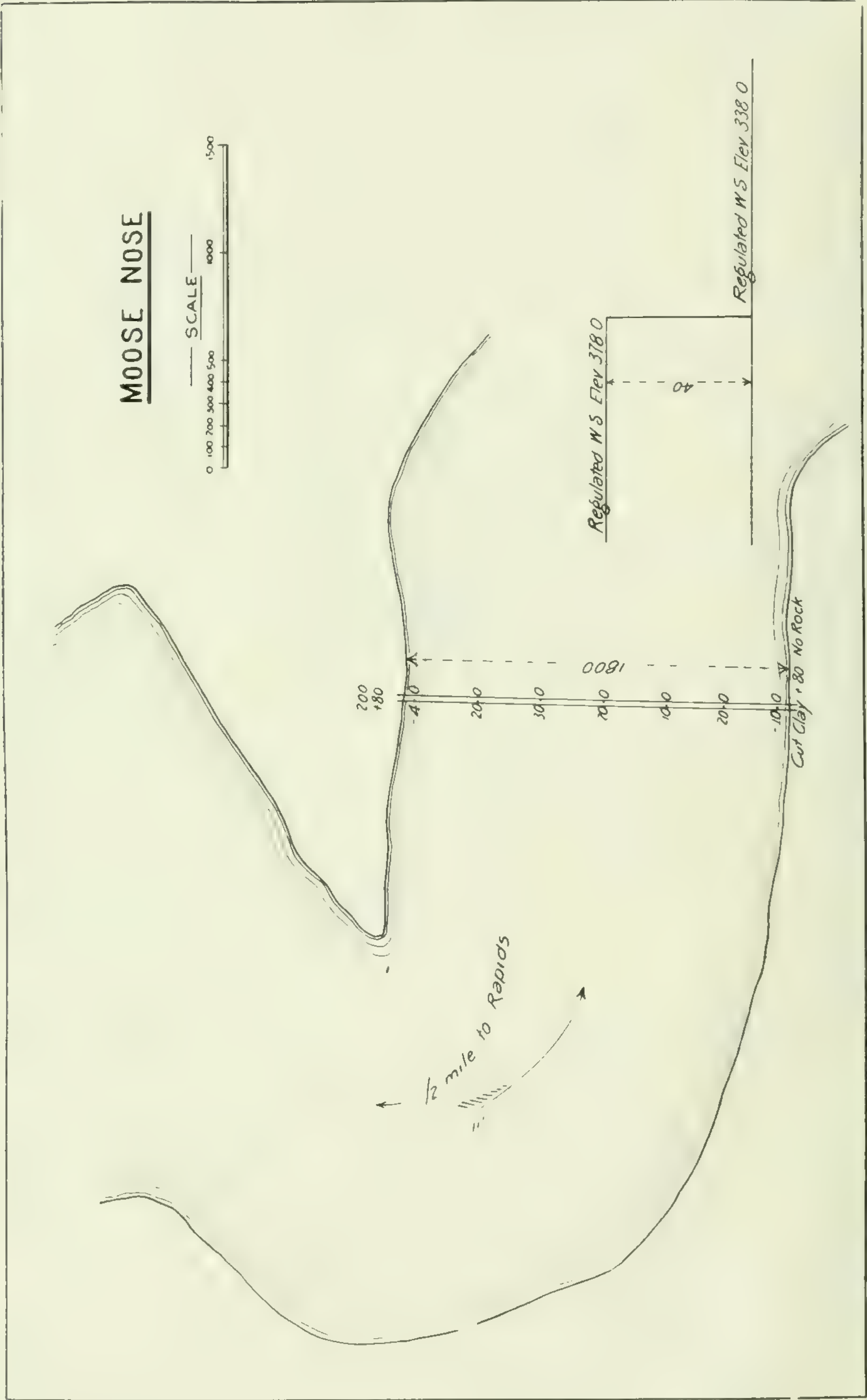


PLATE No. 13.



SESSIONAL PAPER No. 19b

The next location chosen for a dam was above last Limestone rapid (Plate No. 18).

The width is 2,200 feet, and banks are good. Soundings are shown on the plate.

The next dam would have to be placed about 'The Extreme Head of Navigation.' (Plate No. 19).

From this point to Seal islands, the river has a uniform fall of about one foot to the mile, but the current is very swift, necessitating at least two dams. Locations with soundings are shown at 'Head of Navigation,' Dear islands, and just below Seal islands, (Plates No. 20, 21 and 22).

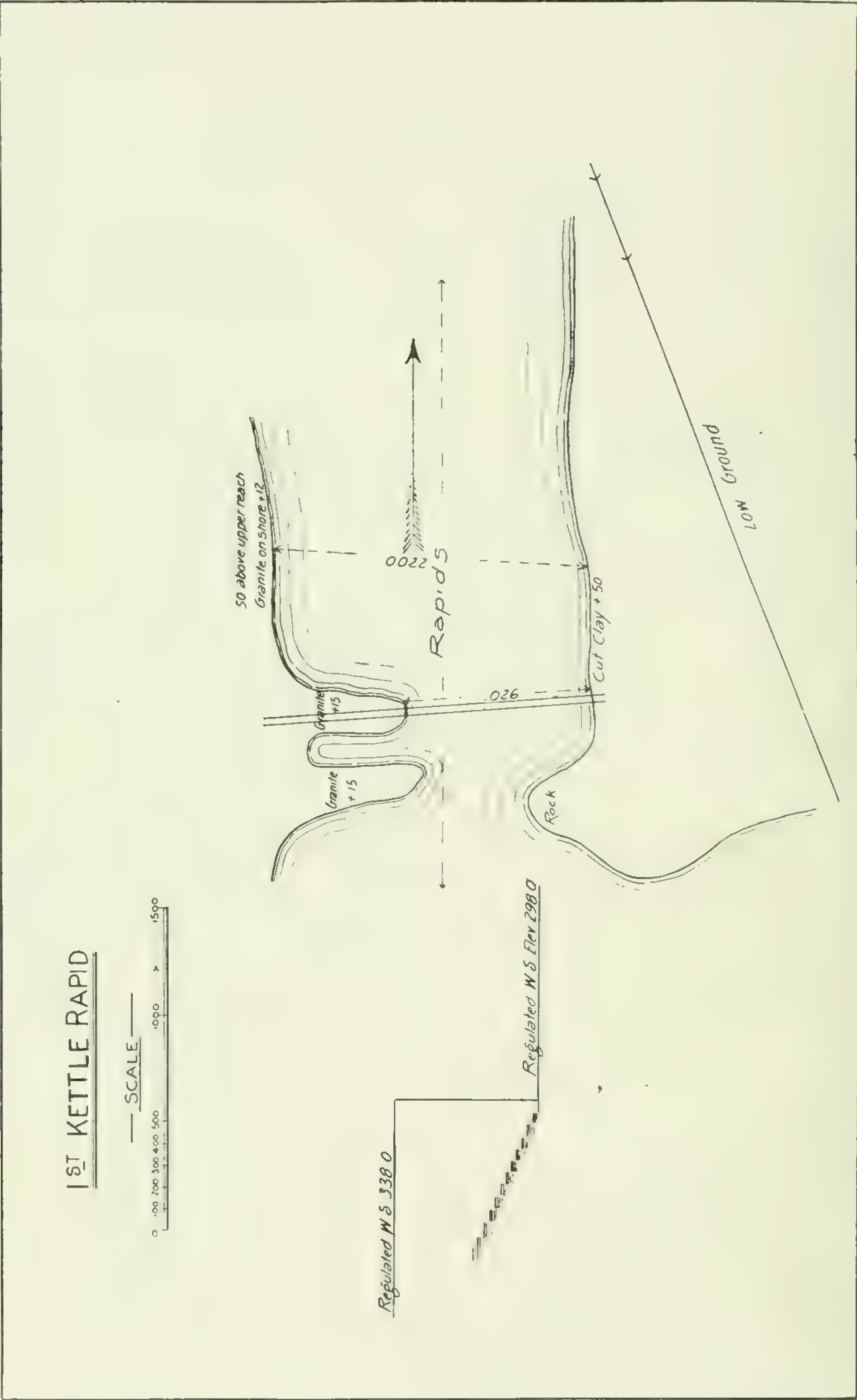
From Seal islands, the channel is irregular for about 15 miles farther down river, that is about half way from Flamborough Head to Beacon Point. From that point to Hudson bay a good channel with 20 feet of water at low tide, has been found.

Respectfully submitted,

E. S. MILES,
Assistant Engineer.

A. R. DUFRESNE, Esq.,
District Engineer,
504 Ashdown Bldg.,
Winnipeg, Man.

PLATE No. 14.



SESSIONAL PAPER No. 19b

PLATE No. 15.

KETTLE RAPIDS

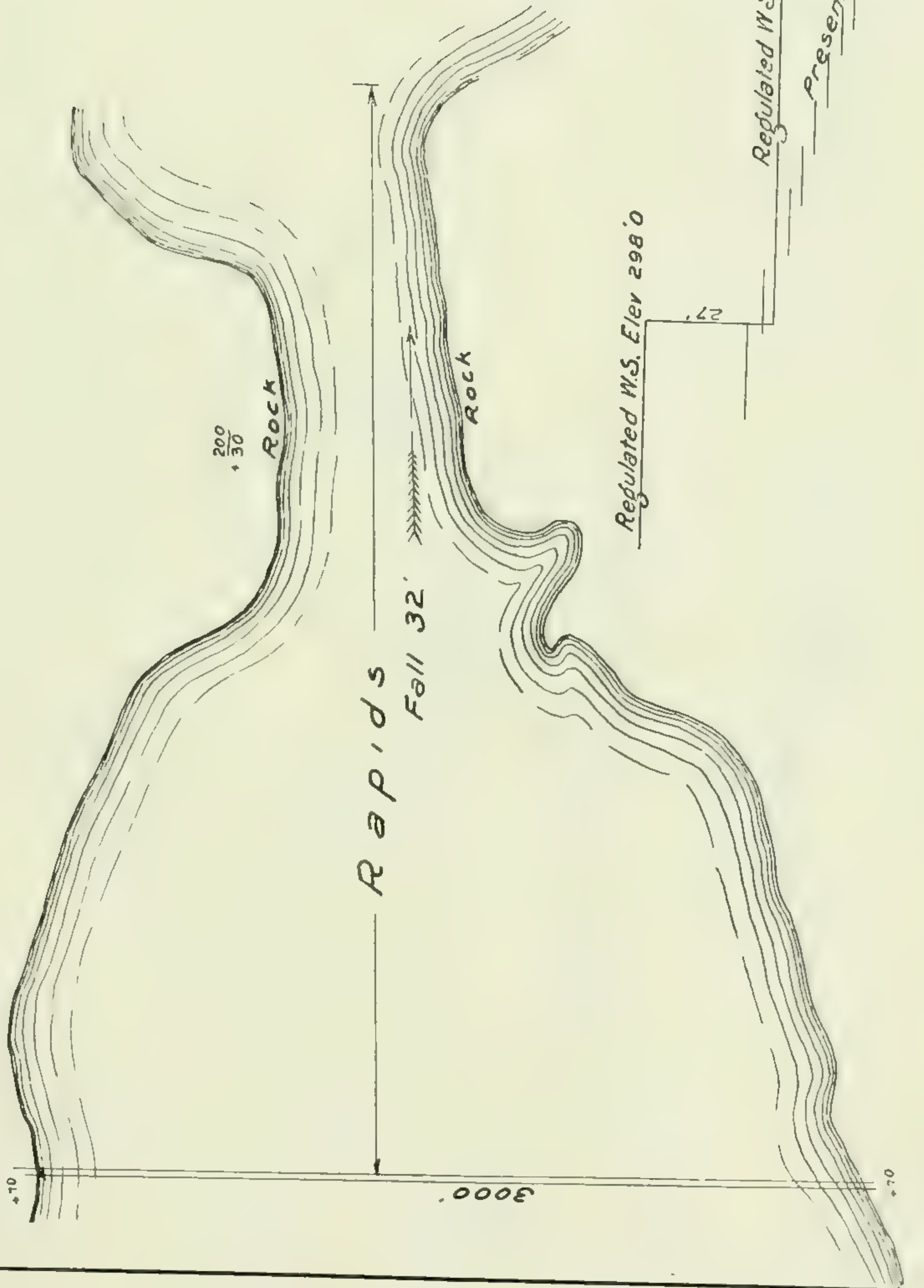
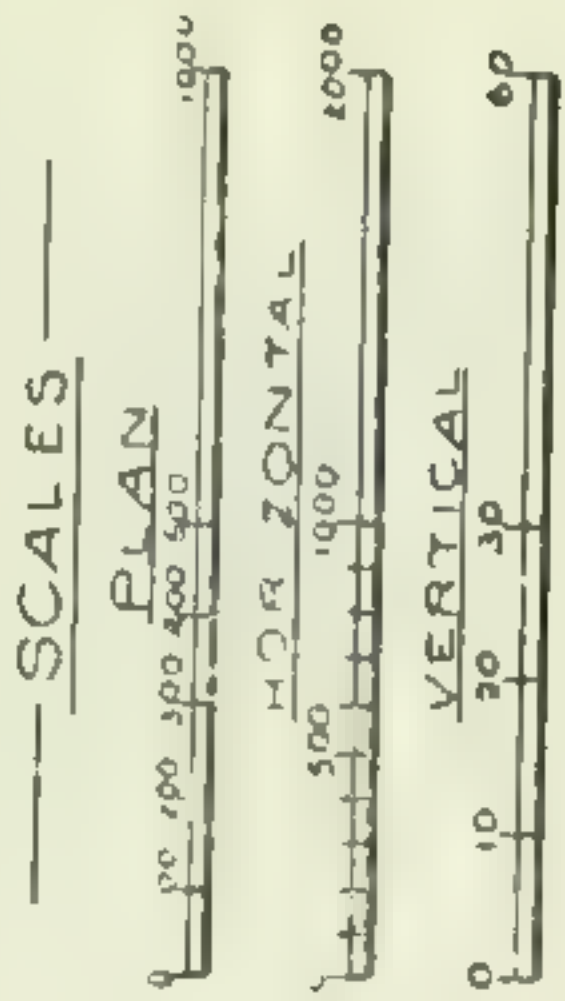


PLATE No. 16.

HEAD OF LONG SPRUCE RAPIDS

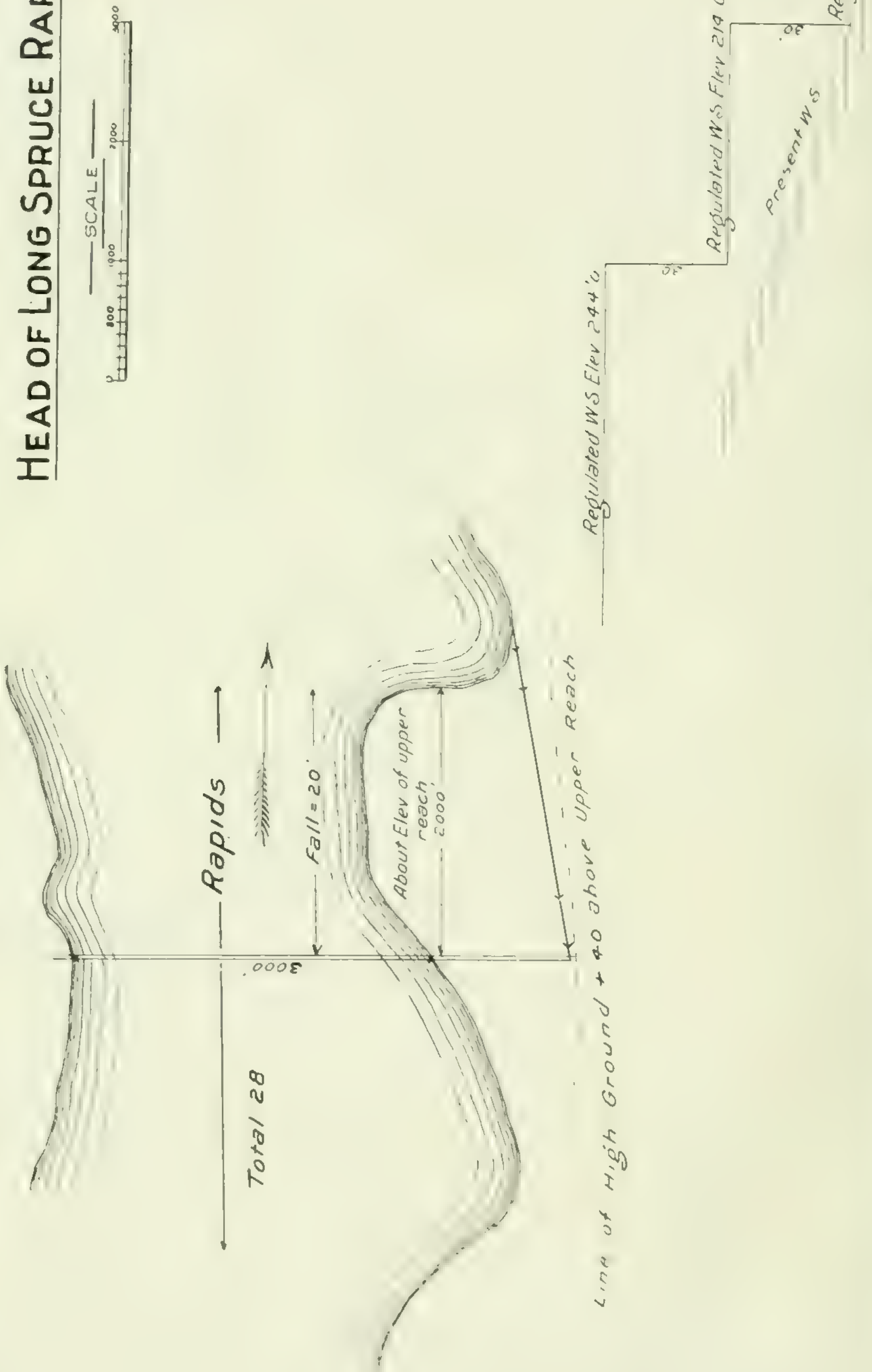


PLATE No. 17.

FOOT LONG SPRUCE RAPIDS

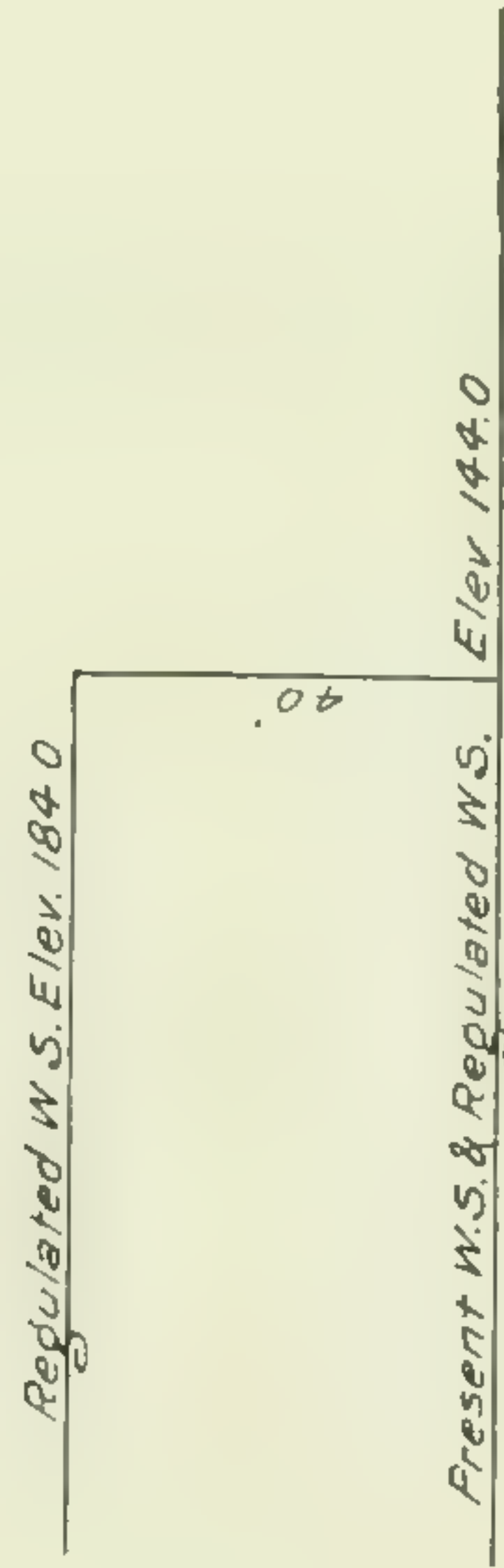
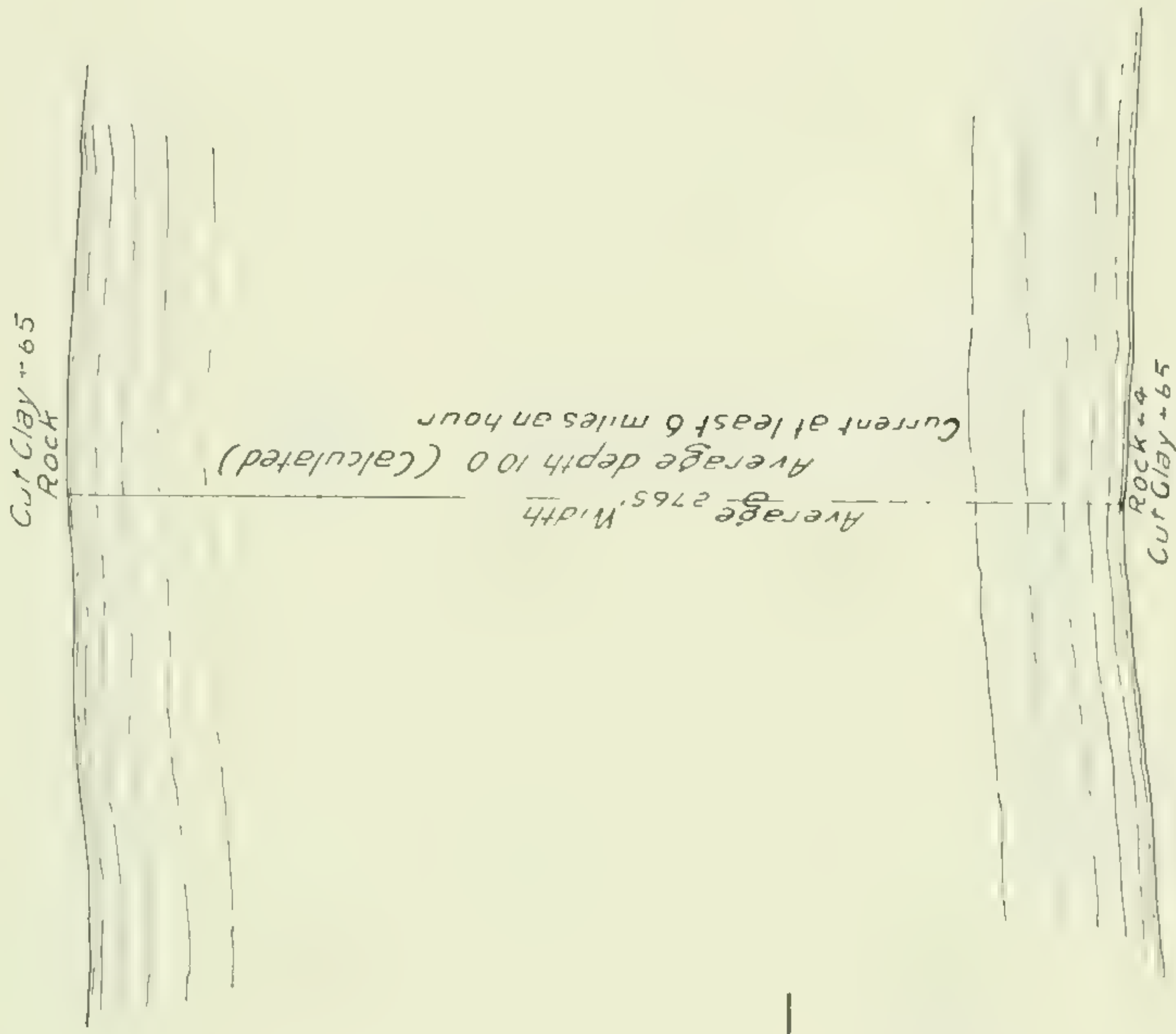


PLATE No. 18.

LOCATION - ABOVE LAST LIMESTONE RAPIDS

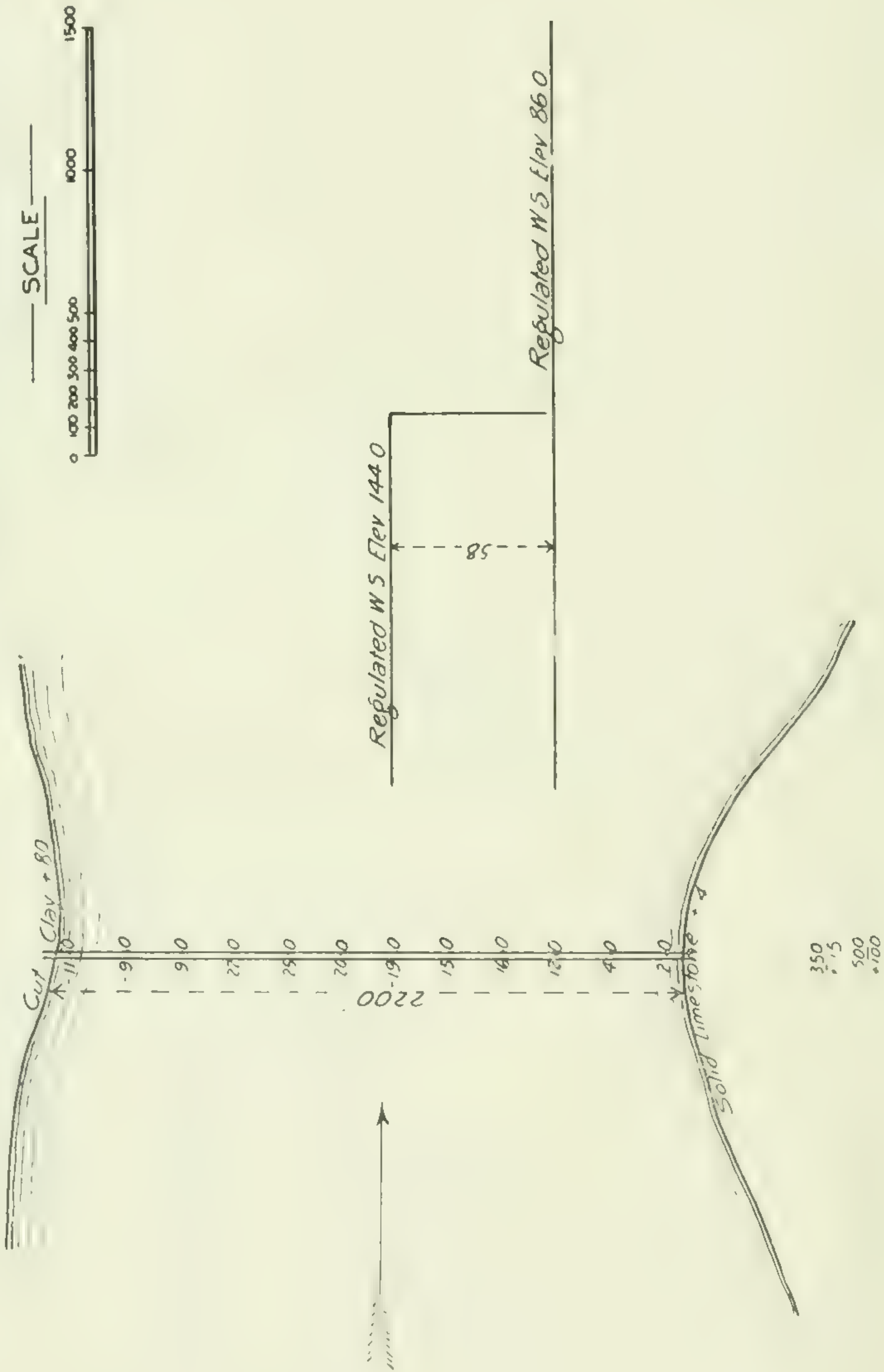


PLATE No. 19.

SESSIONAL PAPER No. 19b

LOCATION - EXTREME HEAD OF NAVIGATION

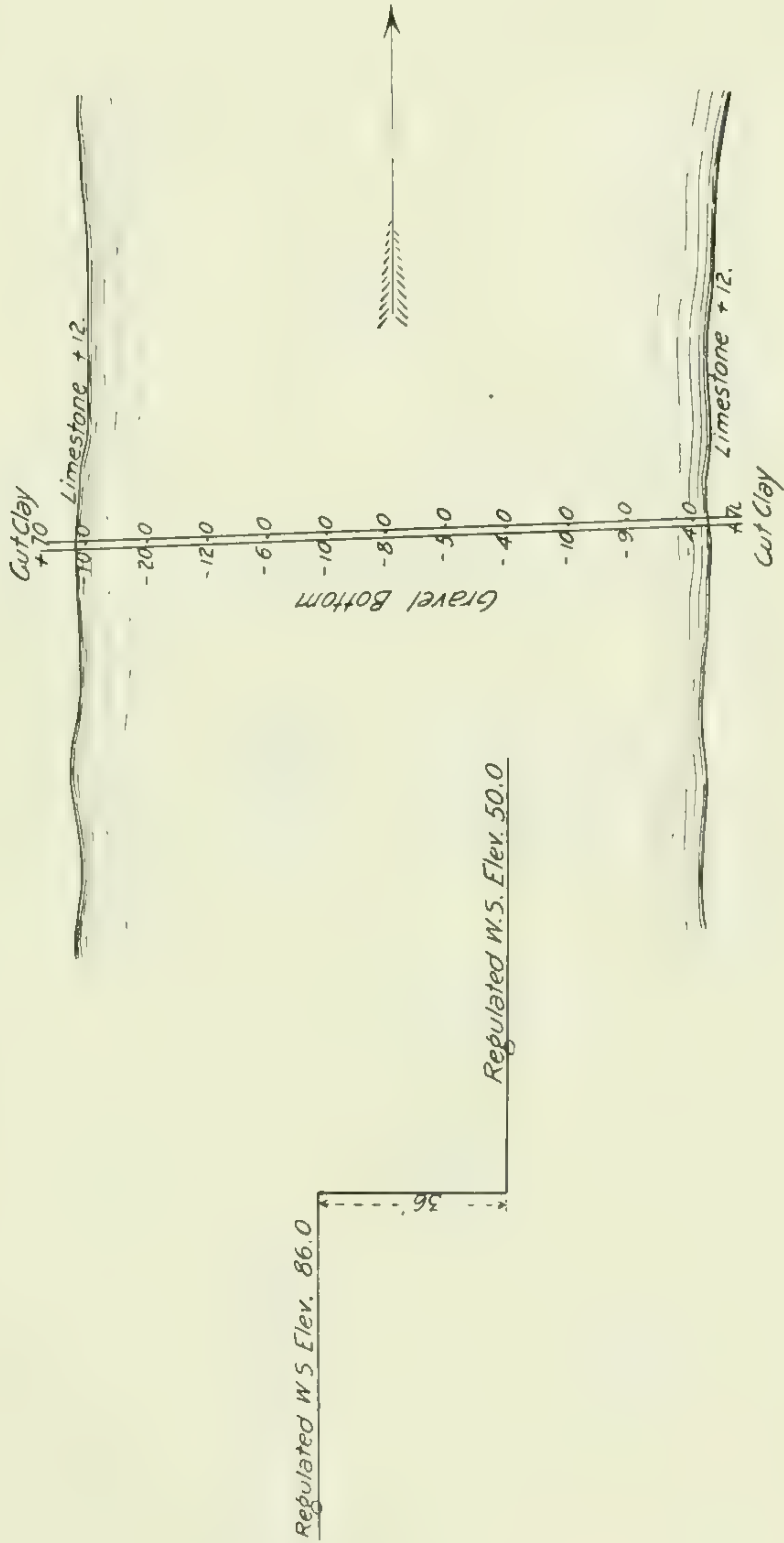
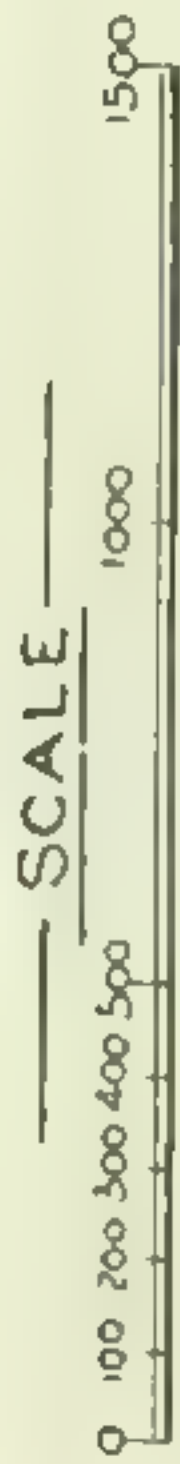
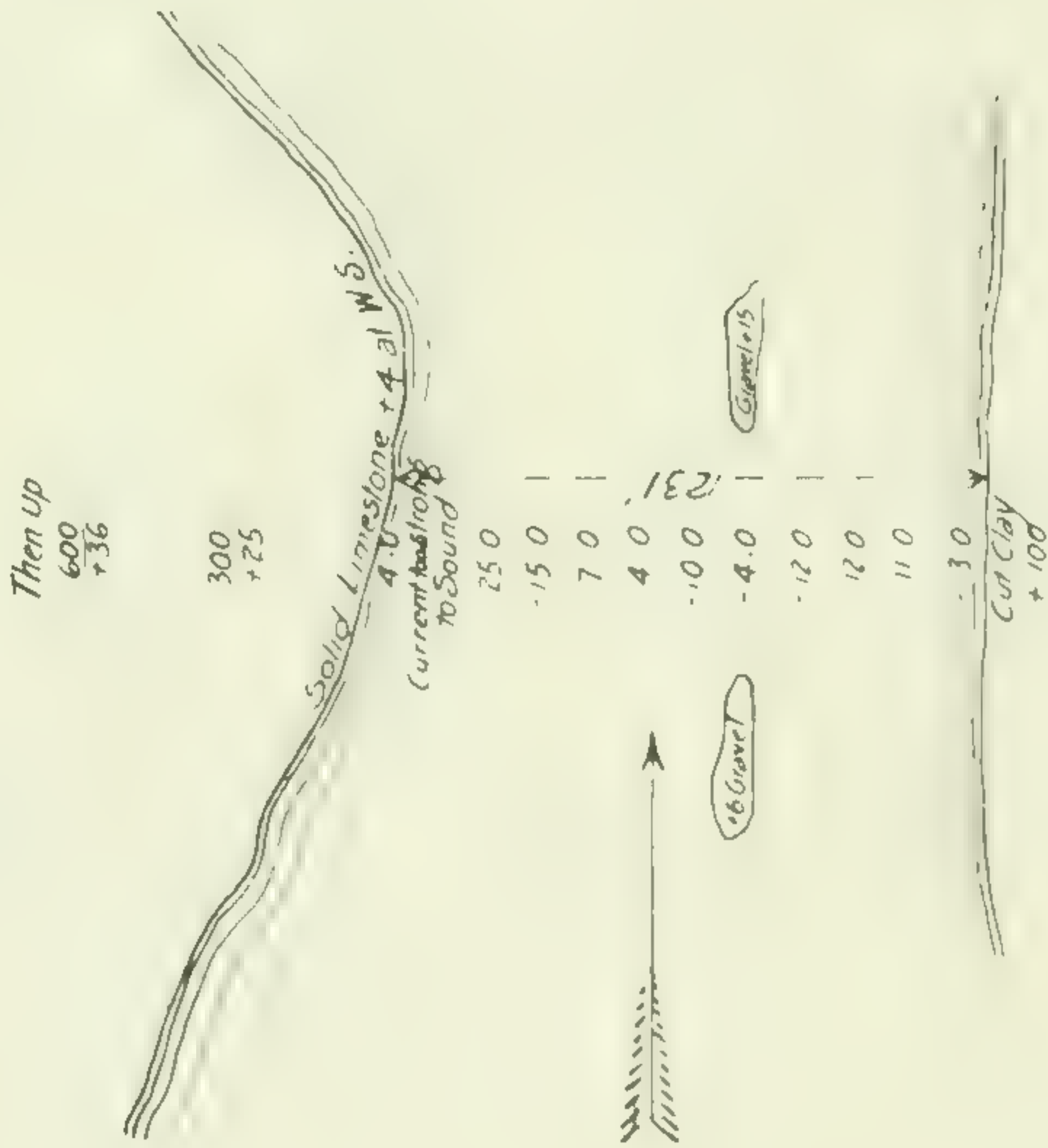
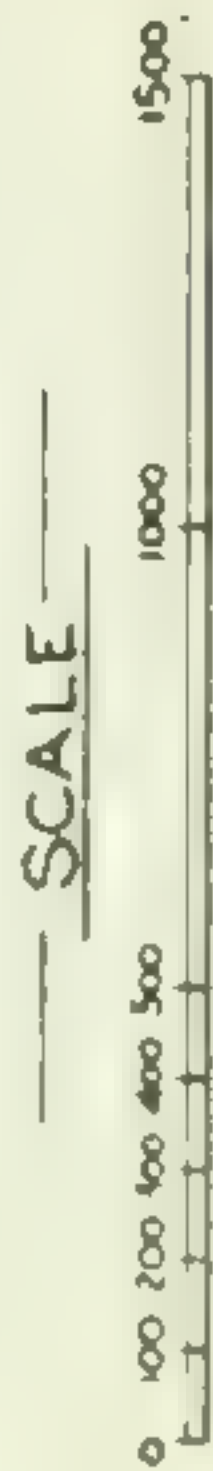


PLATE No. 20.

LOCATION AT "HEAD OF NAVIGATION"



SESSIONAL PAPER No. 19b

PLATE No. 21.

LOCATION AT DEER ISLAND

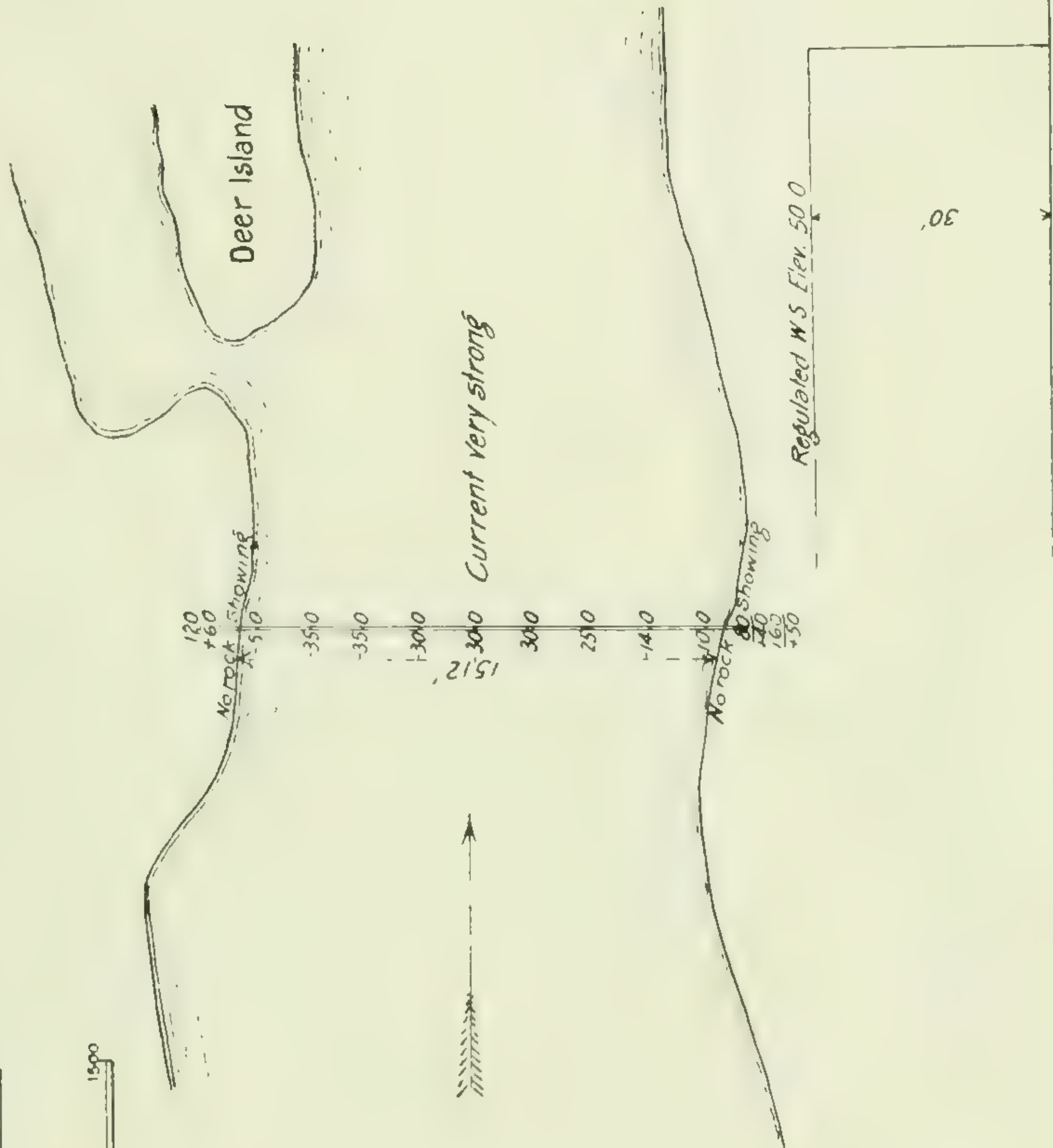
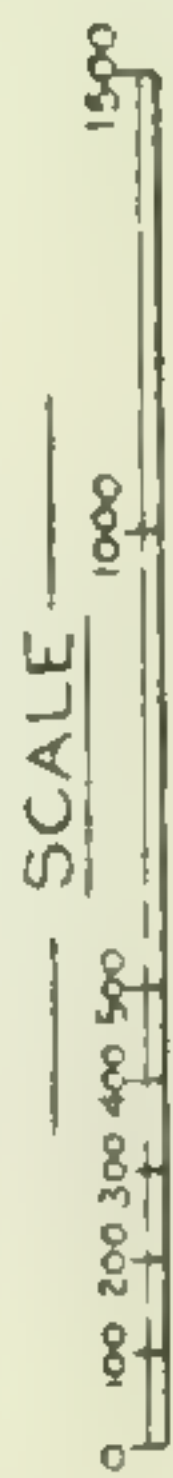
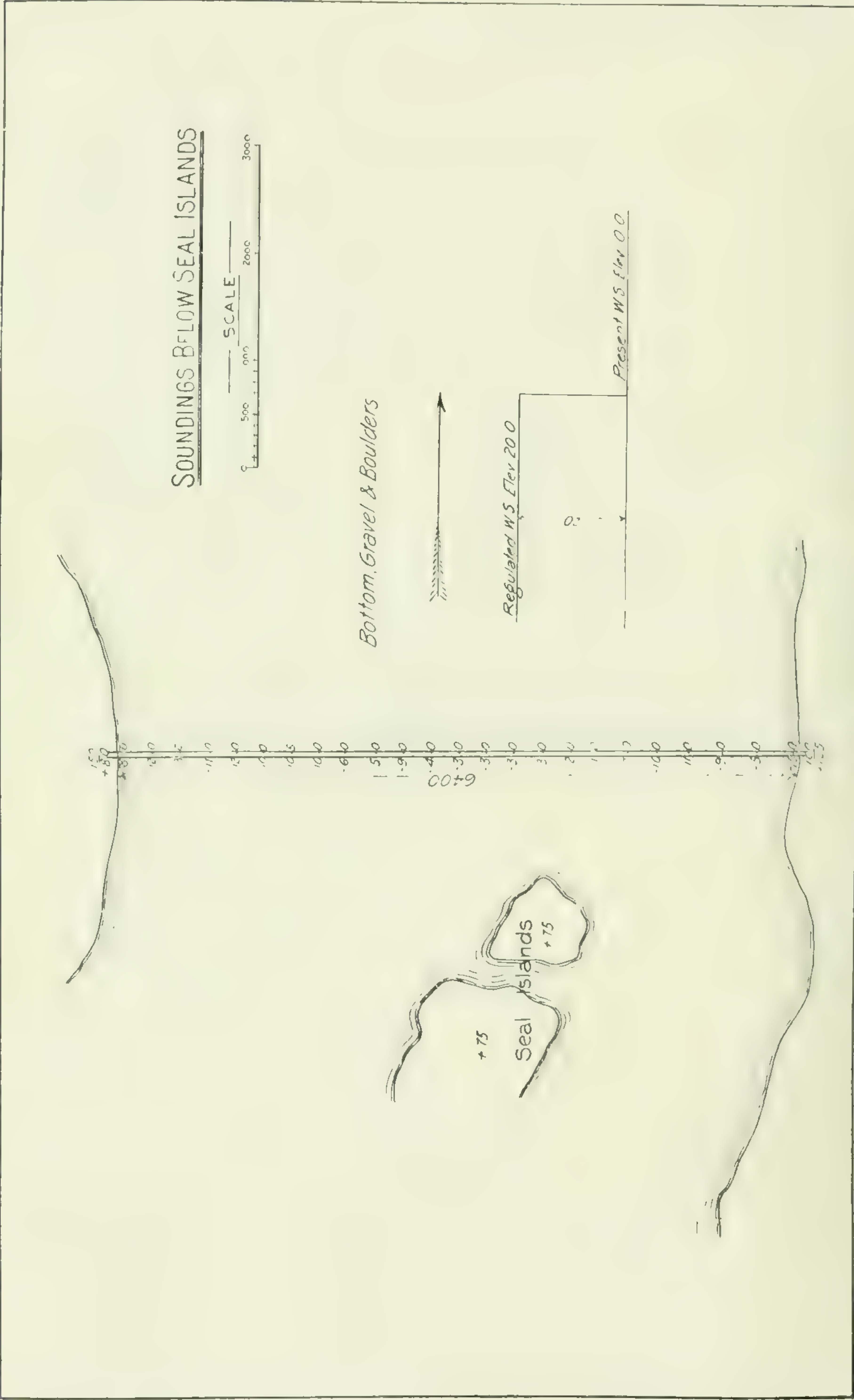


PLATE No. 22



SESSIONAL PAPER No. 19b

SUMMARY OF LOCATION OF LOCKS AND DAMS

Location.	No. of Locks.	No. of Dams.	Lift.
Whisky Jack Portage.....	2	0	45 feet
Ebb and Flow Rapids..	1	3	17 "
White Mud Falls..	1	0	29 "
Bladder Rapids ..	1	1	20 "
Chain of Rocks Rapids.....	1	1	35 "
Devil's Creek	1	1	27 "
Grand Rapids.....	1	1	45 "
Above Gull Lake.....	1	1	36 "
Gull Rapids.....	2	1	68 "
Moose Nose Point.....	1	1	40 "
Head Kettle Rapids.....	1	1	40 "
Foot " "	2	1	54 "
Head Long Spruce.....	2	1	60 "
Foot " "	1	1	40 "
Above Last Limestone Rapid.....	2	1	58 "
'Extreme Head of Navigation'.....	1	1	36 "
Deer Island.....	1	1	30 "
Seal Islands.....	1	1	20 "
	23	18	

N.B.—Locks to be 280 x 45 feet and for 14 foot navigation at low water.

TABLE OF DISTANCES FROM OTTO J. KLOTZ'S SURVEY OF 1884.

DISTANCES FROM WARREN'S LANDING, LAKE WINNIPEG :

To Playgreen Point.....	11 1/2 miles
Norway House.....	23 1/2 "
Sea Falls	42 1/2 "
Pipestone Lake	71 1/4 "
Cross Lake, Hudson Bay Co.'s post....	83 1/2 "
Ebb and Flow Rapids	92 1/2 "
White Mud Falls	96 1/2 "
Bladder Rapids	104 1/2 "
Forks to Duck Lake	106 3/4 "
Over the Hill Rapids	111 "
Red Rock Rapids	114 1/2 "
Chain of Rocks Rapids	119 1/2 "
Lake Sepewesk	122 1/2 "
" Outlet.....	155 "
Devil's Creek.....	168 "
Devil's Rapids.....	210 "
Grand Rapids	226 1/2 "
Chain of Islands Rapids.....	230 1/2 "
Split Lake.....	232 1/2 "
Split Lake, Hudson Bay Co.'s post	246 3/4 "
Gull Lake.....	275 1/2 "
Gull Lake Rapids.....	285 1/2 "
Kettle Rapids	319 1/2 "
Long Spruce Rapids	326 3/4 "
Limestone Rapids.....	344 1/2 "
'Extreme Head of Navigation'.....	355 3/4 "
Seal Islands.....	404 3/4 "
Hudson's Bay	429 1/4 "

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APPROXIMATE WATER ELEVATIONS AT POINTS ON NELSON RIVER.

Location.	Elevation.
Warren's Landing.	700 ft. above mean sea level.
Cross Lake	650 ft. " "
Foot of Bladder Rapids	586 ft. " "
Entrance to Sepewesk Lake	552 ft. " "
Head of Grand Rapids.	504 ft. " "
Split Lake	470 ft. " "
Foot of Gull Rapids	350 ft. " "
Foot of Kettle Rapids	242 ft. " "
Foot of Long Spruce Rapids .	150 ft. " "
Foot of Limestone Rapids...	50 ft. " "
Seal Islands	0 ft. " "

